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 can and should exist to express a general-purpose financial report digitally**.

The XBRL-based, structured, 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.

An XBRL-based digital general-purpose financial report is readable by humans and also readable by machines such as a computer. An XBRL-based 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.

The ideas related to digital general-purpose financial reports can also be applied to special purpose financial reports. To understand the details of XBRL-based digital financial reporting I would invite you to use the resource *Intelligent XBRL-based Digital Financial Reporting*[2].

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

[2] *Intelligent XBRL-based Digital Financial Reporting*, http://xbrl.squarespace.com/intelligent-xbrl/

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> *"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."*
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> *--Albert Einstein*

A manifesto[3] 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. The digital general-purpose financial report supplements rather than replaces current paper or e-paper versions of such reports. This document summarizes information that empowers the global community of professional accountants to think about this possibility and how to make XBRL-based or other digital financial reports work the way they need to work.

This manifesto points out the obvious when it explains that such digital financial reports 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, should, and eventually 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 technical details related to the inner workings of such digital financial reports. Properly communicating how digital financial reports must work to information technology and knowledge engineering professionals will contribute to the creation of simple and easy to use software. The empirical evidence shows that there is no need to "dumb down" financial reporting what-so-ever to make digital financial reporting work.

This manifesto is intended to help certified public accountants, chartered accountants, and certified financial analysts in particular and other business professionals in general contemplate, discuss, otherwise think about, and ultimately recognize that an option can exist and should exist to express a general purpose financial report digitally; and also to help professional accountants and financial

[3] *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

analysts think through how they choose digital general purpose financial reports to work.

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 optimal 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[4]. However, few have attempted to sort through the existing empirical evidence and assembled the individual pieces appropriately into one working system 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 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 knowledgeable observer, using the appropriate tools, shows precisely what is necessary to make such digital financial reports work effectively. Ultimately, it is simply a matter of making a few rather basic "tweaks" that will allow digital financial reporting to work as promised.

Empirical evidence provides information necessary to determine proven best practice-based approaches to making XBRL-based digital financial reporting work effectively. Ignoring the existing empirical evidence serves no purpose.

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

A best practice is a method or technique that has been generally accepted as superior to any other known alternative because the best practice approach produces results that are superior to those achieved by other means or because it has become a standard way of doing things.

This document strives to succinctly summarize key information that is critically important when thinking about how to make XBRL-based digital financial reporting work and provide references to more detailed information which supports or further explains the summary information.

Grand Vision

Financial reporting more naturally belongs in a computer assisted digital world than in a paper-based or what amounts to "e-paper" based world[5]. Financial reporting is based on mathematical models[6]. A financial report is a man-made system.

A *system*[7] is a cohesive conglomeration of interrelated and interdependent parts that is either natural or man-made. *Logic* is thinking according to a set of consistent and coherent rules. A financial report is a man-made logical system[8].

A *pattern* is any form of correlation between the states of elements within a system. The Standard Business Report Model (SBRM)[9] helps you see and explain the patterns or the terms, associations, assertions, and facts that make up the structures which forms the model of a business report.

A financial report is a specialization of the more general business report.

The mathematics of the double-entry bookkeeping model, the accounting equation, the elements of a financial statement defined by a conceptual framework of a financial reporting scheme, the notion of articulation, the notion of intermediate components, and the notions of reporting style explain the logic of a financial report.

How this logic of a financial report works and how these financial reports can be effectively exchanged between business systems is explained in the *Special Theory*

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[5] *Enterprise Common Business Reporting Model*, http://xbrl.squarespace.com/journal/2020/1/15/enterprise-common-business-reporting-model.html

[6] *The Mathematics of Double Entry Bookkeeping*, http://xbrl.squarespace.com/journal/2019/11/4/the-mathematics-of-double-entry-bookkeeping.html

[7] *Systems Theory*, http://xbrl.squarespace.com/journal/2019/12/29/systems-theory-method-to-my-madness.html

[8] *Understanding the Financial Report Logical System*, https://www.youtube.com/playlist?list=PLqMZRUzQ64B7EWamzDP-WaYbS_W0RL9nt

[9] *Standard Business Report Model (SBRM),* http://xbrlsite.azurewebsites.net/2019/Prototype/sbrm/Home.html

of Machine-based Automated Communication of Semantic Information of Financial Statements[10].

And so, if machine-to-machine information exchange works, then it is very possible to configure a system that looks something like this:

To be clear, I am not saying that an artificial intelligence application is going to figure out how to configure and integrate the complete financial reporting process of an enterprise, the vision of Deloitte's *Finance Factory*[11] or similar visions of continuous accounting, or continuous auditing, or other sorts of financial transformations[12] that pretty much everyone agrees will take place in this fourth industrial revolution[13].

What I am saying is that humans, accountants in particular, will put these pieces together using global standards, machine-readable declarative business rules and

[10] *Special Theory of Machine-based Automated Communication of Semantic Information of Financial Statements*, http://xbrlsite.azurewebsites.net/2019/Library/SpecialTheoryOfSemanticCommunicationOfFinancialInformation.pdf

[11] *Deloitte: The Finance Factory*, http://xbrl.squarespace.com/journal/2019/2/20/deloittes-vision-the-finance-factory.html

[12] *Financial Transformation and the Modern Finance Platform*, http://xbrl.squarespace.com/journal/2018/11/2/financial-transformation-and-the-modern-finance-platform.html

[13] *Adapting to Changes Caused by the Fourth Industrial Revolution*, http://xbrl.squarespace.com/journal/2019/8/4/adapting-to-changes-caused-by-the-fourth-industrial-revoluti.html

other metadata using expressive information formats[14], rules engines and other such knowledge-based systems[15], all wrapped together in simple to use but extremely sophisticated software applications.

All of this is going to be incredibly hard work. You cannot simply throw "machine learning" at this problem and let software figure all of this out. Any one that thinks this is both unfamiliar of how computers actually work and are employing "wishful thinking" to solve the problem. What will solve this problem is know-how[16] and hard work.

In order to understand the problem correctly and how computers can be employed to solve the problem, you must have certain specific background knowledge about how computers work. That important knowledge can be gained by reading the document, *Artificial Intelligence and Knowledge Engineering Basics in a Nutshell*[17].

As pointed out in *The AI Ladder*[18], 81% of business leaders to not understand artificial intelligence. Yet, PWC predicts that AI is going to drive a $15.7 trillion increase in GDP, a 14% increase which makes it the biggest commercial opportunity that exists today[19]. PWC is investing $3 billion to upskill their employees to address the current mismatch between existing skills and what is needed in our new digital environment[20].

Again, it is wishful thinking if you believe you have some special magic wand that you are going to wave to make all this simply happen on its own. This is going to be incredibly hard work, most businesses will make a lot of mistakes to learn that they do not really understand what is going on, but eventually people are going to figure all this out and get it right.

Enterprise Common Business Reporting Model

Many regulators around the world have adopted XBRL-based reporting. So ultimately, sure, information will be output from an enterprise reporting system and

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[14] *Revisiting the Knowledge Representation Spectrum*, http://xbrl.squarespace.com/journal/2019/10/9/revisiting-the-knowledge-representation-spectrum.html
[15] *Understanding Knowledge Based Systems*, http://xbrl.squarespace.com/journal/2017/5/3/understanding-knowledge-based-systems.html
[16] Wikipedia, Know-how, https://en.wikipedia.org/wiki/Know-how
[17] *Artificial Intelligence and Knowledge Engineering Basics in a Nutshell*, http://xbrlsite.azurewebsites.net/2019/Library/KnowledgeEngineeringInNutShell.pdf
[18] *The AI Ladder*, http://xbrl.squarespace.com/journal/2019/10/19/the-ai-ladder.html
[19] PWC, *AI to drive GDP gains of $15.7 trillion with productivity, personalisation improvements*, https://www.pwc.com/gx/en/news-room/press-releases/2017/ai-to-drive-gdp-gains-of-15_7-trillion-withproductivity-personalisation-improvements.html
[20] *PWC to Invest $3 Billion in Upgrading Skills*, http://xbrl.squarespace.com/journal/2019/10/12/pwc-to-invest-3billion-in-upgrading-skills.html

be submitted to regulators. Regulators will use algorithmic regulation[21]. So, there exists a global standard syntax to provide information to regulators.

But that standard, XBRL, does not provide everything an enterprise needs to employ digital financial reporting reliably and effectively. XBRL has proved that it is interoperable at the syntax level. But the semantics or meaning being conveyed is not clear to those representing information using XBRL and there are many alternative approaches to representing exactly the same meaning. These issues can be clearly understood by examining what is causing the quality issues in XBRL-based financial reports that have been submitted to the SEC.

SBRM is an attempt to rectify issues related to exchanging meaning related to the XBRL technical syntax. SBRM solidifies the semantics of a business report. The additional semantics of a financial reporting scheme "fits" directly into the SBRM. But SBRM (a) needs to work and (b) needs to be reconciled to some scheme for representing "ontology-like things[22]". The most powerful ontology-like thing currently implementable in software is a logical system or logical theory[23].

It would be absurd for each individual enterprise to be forced to use one common semantic model for all of their internal and external reporting needs. It would be likewise absurd for each individual enterprise to develop their own unique proprietary reporting model that does not reconcile to some global standard business report model.

A middle ground is for all three needs to be met with one common global standard business reporting scheme[24] that was configurable for each individual enterprise, a proven and rock-solid model that each enterprise did not have to independently invent, and a global open standard model that met the needs of the enterprise but also meets the needs of regulators and others in the global financial reporting supply chains that exist.

That one common global standard business reporting scheme can exist and it is based on the following.

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[21] *Open Data and Algorithmic Regulation*, https://beyondtransparency.org/chapters/part-5/open-data-and-algorithmic-regulation/

[22] *Ontology-like Things for Industry*, http://xbrl.squarespace.com/journal/2019/7/13/ontology-like-things-for-industry.html

[23] Explanation of the Financial Report Logical System in Simple Terms, http://xbrl.squarespace.com/journal/2019/11/1/explanation-of-a-financial-report-logical-system-in-simple-t.html

[24] *Enterprise Common Business Reporting Model*, http://xbrl.squarespace.com/journal/2020/1/15/enterprise-common-business-reporting-model.html

A logical system[25] is a type of formal system[26]. What appears to be necessary is a **finite model-based deductive first-order logic system**[27].

"Finite" as opposed to "infinite" because finite systems can be explained by math and logic, infinite systems cannot. "Model-based" is the means to address the necessary variability inherent in the required system. "Deductive", or rule-based, as contrast to inductive which is probability based which is not appropriate for this task. "First-order logic" because first-order logic can be safely implemented within software applications and higher order logics are unsafe. "System" because this is a system.

The point is to create a logical system that has high expressive capabilities but is also a provably safe and reliable system that is provably free from catastrophic failures and logical paradoxes which cause the system to completely fail to function. To avoid failure, computer science and knowledge engineering best practices seems to have concluded that the following alternatives are preferable:

- **Systems theory**: A system[28] is a cohesive conglomeration of interrelated and interdependent parts that is either natural or man-made. Systems theory explains logical systems.
- **Set theory**: Set theory is foundational to logic and mathematics. Axiomatic (Zermelo–Fraenkel) set theory[29] is preferred to naïve set theory.
- **Graph theory**: Directed acyclic graphs[30] are preferred to less powerful "trees" and graphs which contain cycles that can lead to catastrophic problems caused by those cycles.
- **Logic**: Logic is a formal communications tool. Horn logic[31] is a subset of first-order logic which is immune from logical paradoxes should be used as contrast to more powerful but also more problematic than certain first order logic features. Note that deductive reasoning (i.e. rule-based) is leveraged for the process of creating a financial report and not inductive reasoning (i.e. probability-based such as machine learning)
- **Logical theory**: (a.k.a. logical system) There are many approaches to representing "ontology-like things" in machine-readable form, a logical theory being the most powerful. (see the ontology spectrum[32])

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[25] Wikipedia, *Logical Systems*, https://en.wikipedia.org/wiki/Logic#Logical_systems
[26] Wikipedia, *Formal System*, https://en.wikipedia.org/wiki/Formal_system
[27] Wikipedia, *First-order Logic, Deductive System*, https://en.wikipedia.org/wiki/First-order_logic#Deductive_systems
[28] Wikipedia, *Systems Theory*, https://en.wikipedia.org/wiki/Systems_theory
[29] Wikipedia, *Set Theory, Axiomatic Set Theory*, https://en.wikipedia.org/wiki/Set_theory#Axiomatic_set_theory
[30] Wikipedia, *Directed Acyclic Graph*, https://en.wikipedia.org/wiki/Directed_acyclic_graph
[31] Wikipedia, *Horn Logic*, https://en.wikipedia.org/wiki/Horn_clause
[32] *Difference between Taxonomy, Conceptual Model, Logical Theory*, http://xbrl.squarespace.com/journal/2018/12/11/difference-between-taxonomy-conceptual-model-logical-theory.html

- **Model theory**: Model theory is a way to think about flexibility. Safer finite model theory[33] is preferable to general model theory.
- **World view**: The following are common issues which appear when implementing logical systems in machine-readable form, the safest and most reliable alternatives are:
    - closed world assumption[34] which is used by relational databases is preferred to the open world assumption which can have decidability issues;
    - negation as failure[35] should be explicitly stated;
    - unique name assumption[36] should be explicitly stated;

Business professionals are (a) generally not capable of having precise discussions of these sorts of issues with software engineers, (b) don't care to have such technical discussions about these sorts of issues with software engineers, (c) are not interested in the theoretical or philosophical or religious debates that commonly exist related to these alternatives, (d) if the alternatives were ***appropriately articulated to a business professional***, who tend to be very practical, they would most often error on the side of safety and reliability.

As such, a best practices approach would make all of the above decisions which are consistent with modern logic programming paradigms such as Prolog[37], DataLog[38], and Answer Set Programming[39] is preferable. Any technical syntax could be used including XBRL, RDF/OWL/SHACL, Prolog, Datalog, JSON, or whatever other syntax someone may choose to use. But what is common is the logic and model used to represent business information.

Business professionals can simply use this system if they desire to do so, they don't need to reinvent the wheel. But if the logical system does not exist, then they have no other alternative than to create something on their own.

Again, this is all documented in *Special Theory of Machine-based Automated Communication of Semantic Information of Financial Statements*[40]. This is tested and proven to work[41].

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[33] Wikipedia, *Finite Model Theory*, https://en.wikipedia.org/wiki/Finite_model_theory
[34] Wikipedia, *Closed World Assumption*, https://en.wikipedia.org/wiki/Closed-world_assumption
[35] Wikipedia, *Negation as Failure*, https://en.wikipedia.org/wiki/Negation_as_failure
[36] Wikipedia, *Unique Name Assumption*, https://en.wikipedia.org/wiki/Unique_name_assumption
[37] Wikipedia, *Prolog*, https://en.wikipedia.org/wiki/Prolog
[38] Wikipedia, *Datalog*, https://en.wikipedia.org/wiki/Datalog
[39] Charles Hoffman, CPA, *Understanding Answer Set Programming*, http://xbrl.squarespace.com/journal/2019/5/10/understanding-answer-set-programming.html
[40] *Special Theory of Machine-based Automated Communication of Semantic Information of Financial Statements*, http://xbrlsite.azurewebsites.net/2019/Library/SpecialTheoryOfSemanticCommunicationOfFinancialInformation.pdf
[41] *Proving Financial Reports are Properly Functioning Logical Systems*, http://xbrlsite.azurewebsites.net/2019/Library/ProvingFinancialReportAreProperlyFuncioning.pdf

I point out what is provably necessary. But I cannot guarantee that what I am specifying is sufficient. If something is missing, it can be added. If something better is available, it can replace something that exists in this best practices-based approach. What I am convinced that I have done is effectively articulate all the moving pieces of the puzzle. This is, I believe, excellent information that computer scientists can either prove or replace with something better. Either way, business professionals get what they need: something that actually works to meet their goals and objectives.

In the Age of AI

Artificial intelligence is a real thing[42]. Accountants and auditors are notorious for resisting change. You can call it the age of AI or the artificial intelligence revolution or the fourth industrial revolution. You can make the choice to be proactive or you can make the choice to be reactive to this change. But professional accountants really don't have a choice as to whether artificial intelligence will rock their world. It will.

Professional accountants also have a choice about how this next era of accounting, reporting, auditing, and analysis in a digital environment will work.

What I am suggesting, and inviting, professional accountants to do is to take charge. Don't wait on the leadership of the accounting profession to figure all of this out and then follow what they prescribe. As is said, "The best way to predict the future is to create it." That is why I personally have invested the past 20 years to figure out XBRL-based digital financial reporting.

No one has an innate understanding of the impact that artificial intelligence will have. A lot of people will tell you that they do, but they do not. You earn the right to understand the impact by working to figure out the impact.

Good global standards are in the collective best interest of professional accountants[43]. Don't allow the problems of bad and unusable standards to occur. Understand that standard protocols are power and the power needs to be balanced. Rough consensus and running code are perhaps the best way to create good global standards for digital financial reporting.

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[42] PBS Frontline, *In the Age of AI*, http://xbrl.squarespace.com/journal/2019/12/15/frontline-in-the-age-of-ai.html

[43] *Learning from Ten Years of Standardization Failure*, http://xbrl.squarespace.com/journal/2020/1/19/learning-from-ten-years-of-standardization-failure.html

Appendix – Capability of Computers

Computers have four fundamental strengths[44]:

- **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[45] 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.
- **Inconsistent domain understanding of and technology's limitations in expressing interconnections**: 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**[46]: 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.

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[44] Andrew D. Spear, *Ontology for the Twenty First Century: An Introduction with Recommendations*; page 4, http://mba.eci.ufmg.br/downloads/pos/OntologyCenturyPART-Spear.pdf#Page=4

[45] Ibid.; page 4

[46] Ibid.; page 5

Appendix – Extremely 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.

Data and Reality[47], 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[48], by David Wenberger: (277 pages) This entire book is useful. This is a 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.[49], by Emanual Derman: (231 pages) The first 100 pages of this book are the most useful. 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[50], 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 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.

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[47] See, http://xbrl.squarespace.com/journal/2014/7/28/data-and-reality-what-is-the-purpose-of-sec-xbrl-financial-f.html

[48] See, http://xbrl.squarespace.com/journal/2011/1/31/us-gaap-taxonomy-build-it-to-allow-reoganization.html

[49] See, http://xbrl.squarespace.com/journal/2014/7/20/updated-financial-report-semantics-and-dynamics-theory.html

[50] See, http://xbrl.squarespace.com/journal/2015/7/15/understanding-expert-systems-applicability-to-financial-repo.html