

ON THE FORMALIZATION OF ACCOUNTING STANDARDS

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Abstract

Whatever the fundamental cause of business changes, the general response of the American standard-setting community has been to increase the length, breadth, and complexity of standards. I extract the core objectives of these standards and provide a framework for generating standards that meet regulatory requirements while minimizing the burden of compliance for large and small firms alike.

Chapter 2 discusses the potential application of a formalized framework to three separate and diverse areas of accounting standards: recognition of income tax positions, valuation of treasury stock, and income statement presentation. This chapter describes the nature of a formalized standards development environment, one in which standards are formalized as they are developed by the FASB. This process has the potential to eliminate unintentional ambiguities before a given standard is promulgated to firms and the public.

Chapter 3 motivates my study by defining and discussing the concerns of statement preparers regarding a currently proposed change to lease accounting standards. The text of these changes illustrate a more principles- and judgment-based approach to lease valuation, moving away from the well-known bright line regime currently in place in the US. These concerns are cause for significant consternation within and corresponding effort from affected firms in an attempt to keep pace with the changing standard. Pre-implementation concerns and behaviors are catalogued via discussions with professionals within large, publicly traded companies. To gauge post-implementation concerns, I perform a textual analysis of comment letters submitted to the standard setting bodies by constituent firms, noting significant concerns and regressing them along the overall negative tone in a given letter.

Chapter 4 presents an ontology for the process of lease valuation. Drawing on prior ontology development schemes, the history of American lease accounting standards, and the concerns outlined in the prior chapter, I create a framework for analysis of accounting standards. I then apply that framework to the specific needs of lease accounting, setting the elements of a lease along continua of value, time, and certainty. I apply this construct to a sample lease, demonstrating the benefits of application of a simplified, flexible, formalized approach over the current one-size-fits-all scheme.

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1. Introduction

The accounting standards that comprise United States Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS) have increased in significance, complexity, and impact over the past decades (Plumlee and Yohn 2010). This reflects the increasing complexity and diversity of business entities and the transaction recording processes that they employ. Due to the implications of new standards that attempt to guide and regulate financial reporting and the compliance efforts that are undertaken by the affected parties, researchers are actively engaged in deconstructing and observing accounting standards and their implementation (Clor-Proell and Nelson 2007, Kadous and Mercer 2012, Bradshaw and Miller 2008).

The past decades have given rise to several notable business and accounting trends, including the increasingly intricate and diverse nature of transactions (Scovill 1952), numerous accounting scandals and frauds (the savings and loan scandal, the Enron accounting debacle, the crash of 2008, etc.), and a looming convergence between the rules-based US GAAP and the principles-based IFRS. These and other phenomena present challenges to standard setters, tasked not only with keeping pace with the trends of business, but with anticipating and hopefully defusing potential sources of inadvertent or deliberate confusion.

Whatever the fundamental cause of business changes, the general response of the American standard-setting community has been to increase the length, breadth, and

complexity of standards and related guidance (Schuetze 1991)¹. There are many theories for this trend including an effort to over-regulate (Palmrose 2009), bowing to populist pressure as in the case of major scandal and crises (Chang and Evans 2007), and bowing to political pressure to allow vague wording and loopholes (Lander and Auger 2008). Former FASB chairman Bob Herz also lists the conflicting interests of standard-setting participants, resistance to change, an outdated fundamental standards structure, an evolutionary approach that allows for contradictions, a focus on short-term earnings, improper education and training of accountants, rules focused specifically on curbing abuse, and fear of the consequences of being second-guessed (Herz 2006). While these are important topics that warrant further research, they lie outside the scope of this dissertation. Rather I attempt to extract the core objectives of these standards and provide a framework for generating standards that meet regulatory requirements while minimizing the burden of compliance on the part of large and small firms alike.

Information theory

As explained by Shannon (1948), and later elucidated by the same author (Shannon 1998), the transmission of information from one medium to another will result in some amount of information loss. Shannon's focus is on a more literal conception of noise, specifically noise affecting the transmission of binary data.

¹ To a similar extent, this phenomenon has been observed in auditing standards. See (Wyatt 1989).

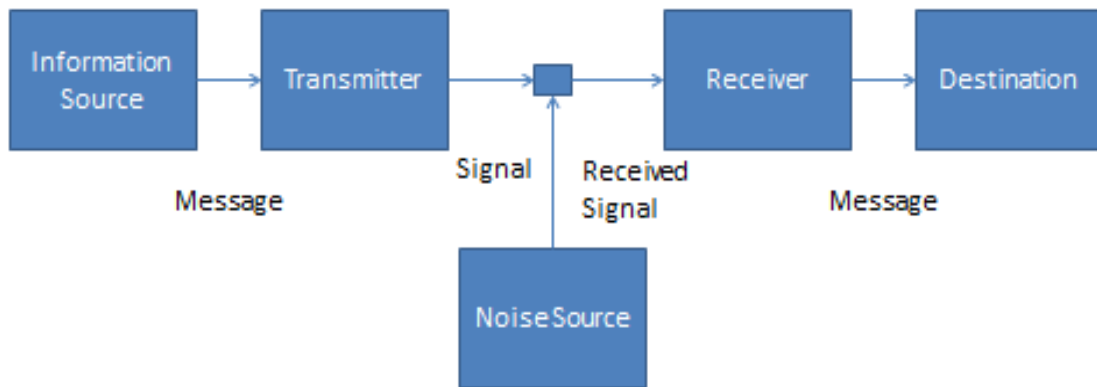


Figure 1: The Shannon (1948) model of information theory.

While Shannon's focus is not perfectly analogous, a corresponding inference can be drawn between his model and the issue of standard setting and promulgation. Standard setters are the source of original information, transmitting principles through written documents (e.g. standards, opinions, exposure drafts). These documents are received by firms who translate them into computer code, adding noise. The resulting, noise-polluted information is implemented into ERP systems from which data is then extracted to compile financial statements.

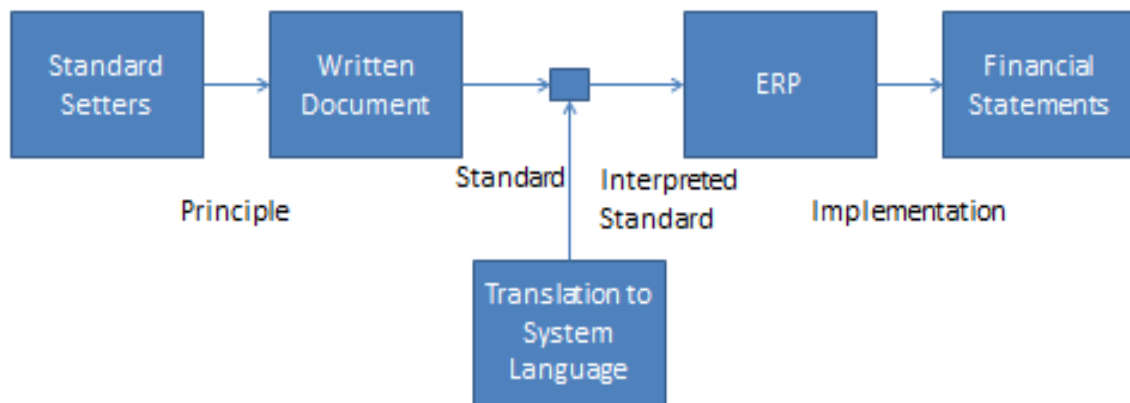


Figure 2: Application of the Shannon model to modern accounting standards promulgation.

The noise inherent in the translation effort stems from two sources:

- Ambiguity in written standards. Any nuance within a written standard that cannot

be properly applied to computer code will be lost unless a human being intervenes either during or after the completion of related automated processes. Unless standards include clearly defined boundaries between purely automatable quantitative elements and more subjective, judgment-oriented components, some data will be lost in translation. Even if this were the case, which it is not, those elements left to the preparer's judgment will still likely be subject to ex post facto rules and tolerances set by that preparer's independent auditor.

- Non-uniform application. In part a by-product of standards ambiguity, deviations from the intended application of a standard are unlikely to be uniform. What Firm A assumes is "systematic" may be completely inappropriate for Firm B. While these diversities may well be intentional (e.g. inventory valuation, uncollectible accounts allowances, depreciation methods, asset pricing models, etc.), in the absence of clear, formalized guidance, there is very little in place to prevent misapplication of standards.

Ambiguity and judgment as sources of restatement

Plumlee and Yohn (2010) perform a comprehensive analysis of the fundamental causes of public firm restatements filed from 2003 through 2006. The primary cause, accounting for 57% of all restatements, is internal error unrelated to accounting standards. The second most common cause of restatement (37%) is misapplication of accounting standards. In order for a restatement to be considered "standards-based," the related disclosure must suggest that the error was caused by a misapplication of an accounting standard *and* that some factor of that standard contributed to the resulting restatement. It is exactly this cause of restatement that we hope to address.

Going further, the study finds that the principal causes of standard-related restatements are ambiguity in the standard itself and misapplication of judgment when using a given standard, together accounting for 95% of such restatements. Both of these causes indicate a failure of communication between standard setters and statement preparers.² These failures are the motivation for this dissertation. If something can be done to ameliorate the concerns of statement preparers and users regarding the perpetually increasing complexity of accounting standards, then it is our duty as researchers to determine the best course of action.

The costs of ambiguity and complexity

Responding to changes in the business environment with an increase in accounting standards complexity evades and defeats the purpose of accounting standards. First and foremost, the entropy introduced by the noise of systems translation reduces the comparability and consistency of financial statements. Second, such complexity distorts and exacerbates the differences between large and small firms. Complexity can generate loopholes (unintentional or otherwise) for savvy, well-financed and -informed firms to exploit in an effort to evade consistent, truthful reporting, while smaller firms are burdened with the task of simply keeping pace with increasingly confusing standards and correspondingly difficult application. A level playing field is not possible when all players cannot afford or understand the requisite equipment, especially if that equipment changes on a perpetual basis.

Complexity of accounting standards also has a consequence of tipping reporting

² These concerns are echoed in the professional literature (Dzinkowski 2007).

power toward the statement preparer and away from the statement user. Prior literature shows that greater financial statement complexity is associated with lower trading volume, especially among small investors (Miller 2010). This complexity, in turn, causes greater reliance upon industry professionals, empowering the few at the expense of the many (Lehavy et al 2011). If greater understanding, control, and discretion all rest with the party of near-perfect internal information, the outsider has no choice but to trust in the judgment of the firm's accounting professionals. Issues of materiality, certainty, and judgment become already-made decisions, and the investor must simply trust in the firm and its auditor to report with not only honesty, but at thresholds comparable to the investor's own.

Research objectives

We advocate a reversal of this trend. Over the course of this dissertation, we present a plan to return to simplified accounting standards via formalization. The process of formalization involves the development of an environment of observation and manipulation accompanied by explicit acknowledgement of constituent variables, attributes, and interactions. In short, formalization answers the question, "What do we seek to observe?" A formalized standards framework will not eliminate judgment, but rather highlight the proper avenues of its application under any given set of GAAP. Changes in accounting standards will then become changes in the manipulation of underlying variables, rather than changes in the variables being monitored.

The development of formalization is not meant to provide a normative

recommendation for standards, but it is instead an effort to bring the creation of standards in greater alignment with their implementation. Accounting has become a computerized language as much as a human one. The “rules vs. principles” dichotomy bears limited relevance to today’s accounting systems. All computers are rule-based by definition, and therefore any vestige of principles contained within a written standard must be ironed into specific rules, sets of rules, or conditions before implementation into an automated system.

If standard setters do not acknowledge the gap between their underformalized, ad-hoc method of standards creation (Mellman and Seiler 1986) and the more formalized approach firms take toward implementation, the formalization gap will be crossed by individuals *other* than the standard setters. In other words, any ambiguities left unaddressed in the initial GAAP framework will necessarily be interpreted by audit firms, CFOs, or IT personnel. By taking ownership of the formalization process, standard setters will assure the public of a more uniform cross-firm implementation and allow businesses to focus on doing business, rather than sweating details regarding complex accounting standards.

Research outline

Chapter 2 discusses the potential application of a formalized framework to three separate and diverse areas of accounting standards: recognition of income tax positions, valuation of treasury stock, and income statement presentation. This chapter will describe and delineate the nature of a formalized standards development environment, one in which standards are formalized as they are discussed and developed by the FASB. Such a

process has the potential to eliminate unintentional and overlooked ambiguities before a given standard is promulgated to firms and the public.

The benefits demonstrated in this chapter will serve to illustrate the benefits of adding formalization to a standard setting body's preexisting development framework, and to project the concept of a unique development process focused on formalization entirely. If formalization can indeed be accomplished and applied at the standards level, this will remove a degree of obfuscation between the inception and the implementation of accounting standards.

Chapter 3 serves as motivation for our study by defining and discussing the concerns of statement preparers regarding a currently proposed change to lease accounting standards. The text of these changes illustrate a more principles- and judgment-based approach to lease valuation, moving away from the well-known bright line regime currently in place in the US. We believe that these concerns are cause for significant consternation within and corresponding effort from affected firms in an attempt to keep pace with the changing standard. Pre-implementation concerns and behaviors will be catalogued via discussions with professionals within large, publicly traded companies. To gauge post-implementation concerns, we will analyze comment letters submitted to the standard setting bodies by constituent firms, noting significant concerns and regressing them along the overall negative tone in a given letter.

Those pre- and post-implementation concerns which we find significant will

ideally motivate and further justify the creation of a formalized framework with clearly defined observational and judgment boundaries. The concerns faced by statement preparers before, during, and after implementation are natural targets for improvement, and any efforts toward formalization ought to take those concerns into account.

Chapter 4 presents an ontology for the process of lease valuation for financial accounting purposes. Drawing on prior ontology development schemes, the history of American lease accounting standards, and the concerns outlined in the prior chapter, we create a framework for analysis of accounting standards. We then apply that framework to the specific needs of lease accounting, setting the elements of a lease along continua of value, time, and certainty. We apply this construct to a sample lease acquired from an actual firm, demonstrating the benefits of application of a simplified, flexible, formalized approach over the current one-size-fits-all scheme.

The necessity of an ontology for the formalization concept cannot be overstated. A proper formal execution can only occur if all variables are properly defined and monitored. By creating and manipulating a lease accounting mini-ontology, we take the formalization concept from hypothetical to practical and begin the journey toward a true, universal accounting standards domain ontology, a necessary precursor to standards formalization.

Through these efforts, we plan to show the necessity, benefits, framework, and execution of formalization, and to lay the framework for a broader application of the

concept in the future. This concept will ideally serve simultaneously to reduce information asymmetry between preparers and users of financial information and to reduce the costs currently inherent in GAAP compliance.

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2. Digital standard setting: demonstrations of concept

Introduction

Companies operating in the United States record and report their economic activity according to a defined set of rules and principles found in the form of accounting standards. These standards, found in U.S. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS) among others, help accountants, managers, information systems designers, investors, auditors, and other stakeholders process and interpret the economic state of a firm. The purpose of accounting standards is to provide uniform, consistent guidance to treat the bevy of sometimes ambiguous and anomalous transactions that occur within a specific period of time.

In principle, accounting standards should clarify and guide the work of accountants; however, the current practice of accounting standards promulgation is rife with unnecessary complexity brought on by ambiguity. The principal concern is that standards are issued in prose form, which lends itself to a wide variety of interpretation. While a fair amount of implementation guidance is generally included with each new standard, this guidance has not prevented variances in implementation. Within the 29 Accounting Standards Updates (ASUs) issued in 2010, there are 12 clarifications, mostly addressing issues discussed in previously issued standards. Further, within those same 29 updates, the phrase “address diversity” appears three times. In other words, there have

been at least three separate instances in which different firms have been able so widely to interpret existing standards as to remain within the bounds of GAAP and simultaneously to merit additional action by the Financial Accounting Standards Board (FASB) to re-align actual practice with the concepts underpinning accounting standards. The confusion resulting from misapplied and misinterpreted standards creates market inefficiency and information asymmetry, obscures the true nature of firms' performance, and is costly and time-consuming for firms, standard setters, and ultimately society at large.

What I advocate here is an expansion of the FASB's current promulgation framework. Specifically, I am illustrating an alternate, pseudocoded standard presentation. By directly translating written standards into a form that can easily be adapted by software developers into proprietary languages and formats, the FASB will reduce ambiguity, increase uniformity of application, and reduce the lag between the introduction of a standard and the universal implementation of that standard.

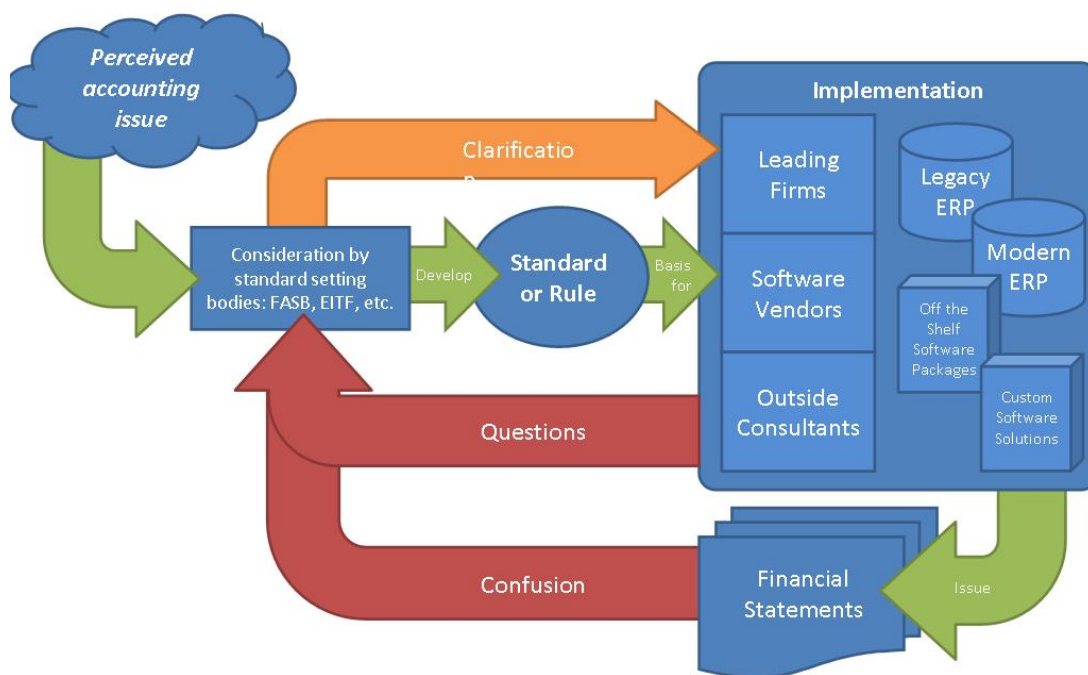


Figure 1: Current standards implementation process

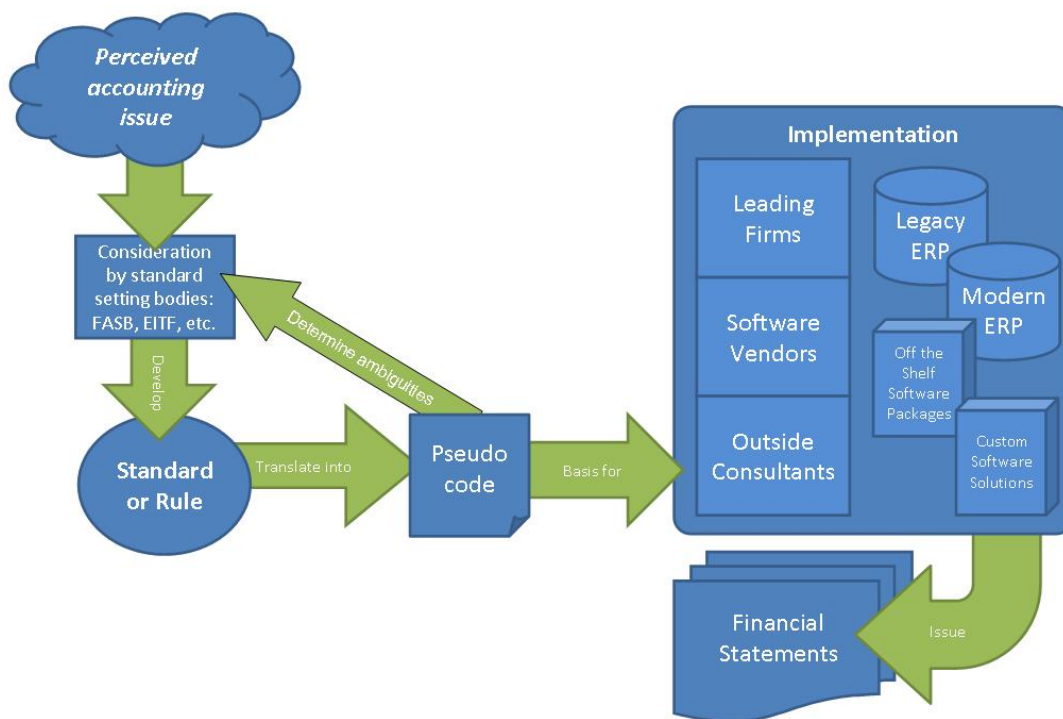


Figure 2: Proposed implementation process after introduction of formalization

It is important to note from the outset that I am not calling for the abolition of current, English-language standards, but only their enhancement with a pseudocode complement. I see no reason to do away with the conventional method of GAAP promulgation, and it still provides several benefits that cannot carry over to abbreviated formalizations. For example, if an accountant wishes to determine the underlying causes of a change in accounting rules (in order, perhaps to justify a potentially tenuous decision on novel issues), pseudocode will likely prove inadequate.

The recent enactment of the FASB's codification project indicates that the FASB is willing to make efforts to simplify the use of its standards (McEwen and Hoey 2006). By advocating this advance, I am urging the FASB and IASB to further simplify the dissemination of GAAP and to clarify its meaning for the next generation of standards users.

Literature review

Examples from other fields

While the application of pseudocode to accounting standards is novel, the use of formalization to address ambiguity is a technique well-researched in a wide variety of literatures. Generally, wherever procedural rules lack clarity, or are perceived as lacking clarity, formalization has been brought forth as a potential solution to the problem.

A good amount of work has been done to apply the benefits of formalization to medical procedural literature. (ten Teije et al 2006) acknowledge that quantity does not equate to quality; specifically, the large volume of medical practice guidelines and protocols issued in the past decade has been riddled with ambiguity. The authors suggest formalization of pre-existing protocols in an effort to discover and address problems of ambiguity nested within prose instruction. They successfully identified several serious problems in the protocols under study, and thus concluded that formalization can be a useful tool in improving medical protocols.

(Goud et al 2009) recently completed a study demonstrating the benefits of formalization to verify the logical structure, consistency, and completeness of guidelines relating to clinical practice. Their study is of particular value because it merged the formalization of the guidelines with the development of the guidelines themselves. The authors concluded that such a parallel development procedure is practically feasible, and furthermore that it “ensures a close correspondence between the narrative and formalized guideline” (p. 519).

Formalization has been applied to the development of computer programs themselves (Bronevetsky and Supinski 2007), and specifically a set of best practices regarding design patterns in software implementation (Taibi 2006). The problem of semantic interoperability between different systems in open environments has likewise been addressed with the formalization of ontology mapping (Bo and Bin 2008). These

papers lend additional theoretical backing to this work when considering both the ubiquity and the diversity of computerized accounting software applications.

Necessity of formal accounting standards

The necessity of a revolution in standard setting is made clear in the literature. Questions have been raised regarding many aspects of the FASB's standard setting practice, from inconsistent application of FASB agenda formation policies (Howieson 2009) to specious benefits of a focus on rules-based accounting standards (Benston et al 2006) to the very applicability of any FASB-sourced standards to economic reality (Lee 2006). Discouragingly, (Tandy and Wilburn 1996) observe that academics may opt not to participate in the standard setting process via submission of comment letters to the FASB in part because of a low expectation of influence on standard setting decisions.

The very purpose of setting standards is a topic of debate. The standard setting process has itself long been under scrutiny, especially given recent accounting scandals, and the corresponding upheaval of the capital markets. (Herz 2010) strongly advocates the “decoupling” of accounting standard setting from the setting of regulatory capital and reserves, while (Cheney 2009) describes a movement to create a government oversight organization with the power to change accounting standards in order to protect the stability of capital markets.

The professional literature includes mention (Greenspan and Hartwell 2009) of the need for the FASB to make accounting standards more understandable, despite those

efforts already made by the FASB in the wake of the passage of SOX. Indeed, (Pounder 2010) recommends the development of size-scaled GAAP, asserting that for small firms, “the cost of participation in the process [of standards implementation] can be prohibitive.”

Over seventy years ago, ambiguity was recognized as a costly opponent of comparability (Stempf 1938). The past thirty years of accounting research include several studies on standards inconsistency, either between two or more standards or between individual standards and the conceptual framework of US GAAP (Hatherly 1982, Wustemann and Wustemann 2010, Nobes 2005, Thompson et al 1987, Mozes and Schiff 1995, Loftus 2003). Forsyth and Dugan (2006) have designed an educational case study based on US GAAP’s inconsistent treatment of executory contracts. (McSweeney 1997) proposes the pursuit of an ambiguity-free accounting universe as a productive course of action.

Ambiguity has been shown to have real-world consequences, allowing inertial tendencies to continue within management accounting (van der Steen 2009). As formalization cannot tolerate inconsistency, I propose it as a solution.

Pseudocode

The purpose of pseudocode is to bridge the gap between written language and formalized computer code. It intentionally contains no platform-specific language, and it

follows a linear logic as closely as possible. Pseudocode is already used with great benefit by programmers themselves as a tool to bridge the gap between concept and execution (Bellamy 1994). Pseudocode provides several advantages over written language:

- It is more concise, clearer, and contains less potential for ambiguity. (Roy 2006)
- It provides those an idea of the basic action taken by a computer system during a specific set of routines, algorithms, or procedures. (Roy 2006)
- It provides a template for translation by programmers into specific languages (e.g. C++, Java, etc.) that is more straightforward and user-friendly than plain English text (Bellamy 1994).

As a demonstration, consider a simple system designed to assign passing or failing grades to students on an exam. If the student scores 70% or higher, s/he passes; if not, s/he fails. The following pseudocode reflects this concept in a formalized manner:

```

101 for Student(x)
102   if Score(x) ≥ 70
103     Grade(x) = pass
104   else
105     Grade(x) = fail

```

Figure 3: Pseudocode example.

Pseudocode¹ is a loosely defined concept; some instances may be held to very rigid standards, while others are barely differentiable from prose. I am making several basic assumptions, both about the universality of the code presented and the nature of the accounting system for which it is intended. In terms of the code itself, I am making two assumptions which all pseudocoders must make: first, that any operations or variable types which are presented here must be translatable into any relevant programming language, and second, that the fundamental structure is at least loosely similar to that of actual software structures already in place in intended systems, in this case ERPs or other accounting systems.

The assumptions made about the implementing company's accounting system are based either upon similar assumptions made in FIN 48, or else common-sense assumptions that can be safely made about the vast majority of interactive computer systems. I am assuming that human interaction is limited to the actual decision to be made, and that all presentation choices either have been pre-decided by the system being used, or else will be decided at a later point in time. I also assume that at the time when the new position is entered, the individual(s) in charge of data input has access to all available and relevant information about that position.

At a macro level, I am assuming that this code does not stand alone, but rather that it can be integrated into an already established framework, presented in the same language with the same precision. I will not, for example, translate tax laws, presentation

¹ For a detailed instance of pseudocode syntax, see http://users.csc.calpoly.edu/~jdalbey/SWE/pdl_std.html.

parameters, or any other relevant regulations, but such translation will need to take place if this stated goal is to be effectively realized.

Illustration #1: Pre-Codification- Uncertainty in Income Taxes (FIN 48)

The first of three examples is a re-presentation of paragraphs 3 through 8 of FASB Interpretation No. 48: Accounting for Uncertainty in Income Taxes (hereafter referred to as FIN 48), using the above-described presentation schedule. The complete text of paragraphs 3-8 is presented in Appendix A.

FIN 48 was created to address a vagary present within FASB Statement No. 109: *Accounting for Income Taxes* (FAS 109), a statement prescribing GAAP for income tax presentation within accounting statements. In its original form, FAS 109 left no guidance about a corporation's recognition threshold for tax positions; in other words, there was no guidance for a company with a tax position that held a 30% likelihood of being sustained upon review by taxing authorities. The same held true for positions with a 50% or 70% likelihood.

The problem was addressed by FIN 48. This interpretation establishes a two-part tax position scheme: recognition and measurement. Recognition is a binary first step. A company must determine whether any portion of a given tax position is “more likely than

not” (i.e. greater than 50%) to be sustained upon review. If no portion of the position meets the threshold, then the position is not recognized. If, however, any portion of the position does meet that threshold, then only that portion which does meet the threshold will be recognized in subsequent financial statements. Further, the standard stipulates that a decision on recognition or non-recognition may only be changed in the face of new information or a change in relevant tax laws.

Such is the substance of paragraphs 3 through 8 of FIN 48, which are, themselves, the essence of FIN 48. The actual text is fully presented in Appendix A.

Pseudocode

The following section presents a basic, pseudocoded translation of paragraphs 3 through 8 of FIN 48.

```

100  for NewTaxPosi tion

101  display YesNoQuery "To the best of your current
knowledge, is any portion of this tax posi tion more likely
than not to stand up to review by relevant authorities?"

102  if No

103  display "Until the certainty of this posi tion
increases past the 50% threshold, the benefits of this
posi tion will not be included in the company's audited
financial statements. "

104  else

105  display AmountQuery: "What is the dollar amount of
expected benefi t (as a portion of the total benefi t claimed
above) that is more likely than not to stand up to review by
relevant authorities?"

106  if Posi ti onValue – Response > 0

107  display "Until the certainty of this portion of the
posi tion increases past the 50% threshold, the benefits of
this posi tion will not be included in the company's audited
financial statements. "

108  end

```

Figure 4: Accounting standards represented in pseudocode.

This presentation is certainly not exhaustive, as the additional paragraphs of FIN 48 would necessitate the creation of new modules and a level of analysis beyond the scope of this paper. However, pseudocoding must be possible for the vast majority of FASB standards and interpretations; after all, the entirety of the FASB's actions must be computerized if a company is to be expected to automatically generate GAAP-compliant statements at a moment's notice.

Illustration #2: Post-Codification- Treasury Stock Valuation (505-30-30)

Recent efforts by the FASB, specifically the recent enactment of the FASB's codification program, create a new set of parameters by which to judge the success of this proposed standards transition. After all, if codification accomplishes the ends I endorse, there will be no value in implementation. Before discussing this issue, we must first acknowledge what codification has and has not done to bring the accounting world into the 21st century.

The codification project "reorganizes the thousands of US GAAP pronouncements into roughly 90 accounting topics and displays all topics using a consistent structure" (FASB press release, 7/1/09). The importance of this successful effort is considerable; as there is now one official, authoritative, and perpetually updated source for non-governmental US GAAP, clearly organized into uniform levels of paragraphs and sub-paragraphs, students and professionals alike will be able to research relevant issues and reach important decisions at a far more efficient pace. Uniformity of treatment is pervasive throughout the codification scheme, as reference numbers follow one standard formula.

While codification clearly represents progress towards a more formalized reality,

it is not sufficient. More can be done. I have therefore selected a subsection of the codification and re-presented it under the proposed paradigm in order to gauge the presence and significance of potential benefits. This example (paragraphs 505-30-30-1 through 505-30-30-4, included as Appendix B) deals with treasury stock valuation upon initial purchase, and I find that significant benefits can still be realized through the use of pseudocode.

Pseudocode

```

100 for NewStockPurchase
101 if NewStock (Issuer) = Self
102 goto 104
103 else goto OrdinaryStockPurchase
104 display AmountQuery: "What is the total price (monetary
or otherwise) that has been and/or will be paid in this
transaction?"
105 store Amount as NewStockPurchase Price
106 if NonCashValue of NewStockPurchase > 0
107 goto 109
108 else TreasuryStock + NewStockPurchase Price = Treasury
Stock
109 display Query: "Which is more clearly valued in this
transaction: 1. The repurchased stock; or 2. All other
considerations?"
110 if 2
111 goto 116

```

```

112 else display AmountQuery: "What is the value of the
    repurchased stock?"

113 StockPurchase Price – Amount = Consideration Value

114 (Amount – Consideration Value) + Treasury Stock =
    Treasury Stock

115 end

116 display AmountQuery: "What is the value of all other
    considerations?"

117 StockPurchase Price – Amount = NewTreasuryStock Price

118 (Amount - NewTreasuryStock Price) + Treasury Stock =
    Treasury Stock

119 end

```

Figure 5: Pseudocode for Treasury Stock Valuation.

Illustration #3: Income Statement

At a minimum, current accounting standards will benefit from post-hoc formalization by the FASB. All standards relevant to a firm of sufficient size are implemented into that firm's ERP system, with the requisite formalization and coding being accomplished by a third party. On a basic level, this would not pose any significant issue. If a rule is simple enough, its formalization becomes a trivial task. However, as complexity increases, so do the chances for diversity in interpretation.

An iterative formalization of the income statement will serve as an example.² At its core, the income statement can be formalized in three lines:

² See Vasarhelyi and Krahel (2011) for further examples of formalized GAAP.

101 present Revenues

102 present Expenses

103 present (Revenues – Expenses) = “Net Income”

Figure 6: Basic Income Statement Formalization

While this example is technically correct and provides some information, it is not nearly detailed enough to reflect the actual state of affairs for a business. Drawing from codification section S99-2, presented in full as Appendix C, we can drill-down line 102 into further detail:

102.1 present CostOfGoodsSold

102.2 present OperatingExpense

102.3 present RentalExpense

102.4 present CostOfServices

102.5 present OtherMatchedExpenses

102.6 present OtherOperatingExpenses

102.7 present SellingGeneralAdministrativeExpenses

102.8 present ProvisionForDoubtfulAccounts

102.9 present OtherExpenses

Figure 7: Expanded Expenses Section Formalization

This example provides richer detail, more closely approaching an accurate description of underlying economic events and the traditional income statement

presentation. However, the generation of these figures remains unexplored, and it is this component of the statement generation process that contains the bulk of the ambiguity I hope to address. For example, Section 705-10, guidance on Cost of Sales and Services, links to 18 other codification sections containing guidance on such topics as lower of cost or market adjustments, extended warranty and product maintenance contracts, and shipping and handling costs.

One of the Cost of Sales and Services paragraphs, 705-10-25-10, links the user to paragraphs 605-50-25-10 through 25-12, among others, “for a discussion of the accounting for cash consideration given to a reseller of a vendor's products.” Paragraph 605-50-25-10 explains that the cost of sales reduction pursuant to such an arrangement

shall be recognized...based on a systematic and rational allocation of the cash consideration offered to each of the underlying transactions that results in progress by the customer toward earning the rebate or refund provided the amounts are probable and reasonably estimable. If the rebate or refund is not probable and reasonably estimable, it shall be recognized as the milestones are achieved.

No such “systematic and rational allocation” is described; we can only assume, in the absence of such guidance, that the development and implementation of such a system rests in the hands of individuals, and an infinity of possible allocation systems may exist in practice. The following paragraph, 605-50-25-11, provides examples of situations that may impair the customer’s ability to determine whether rebates or refunds are “probable and reasonably estimable,” but no hard-and-fast rules are supplied. 605-50-25-12, meanwhile, describes the precise manner of adjustment to be applied in the case of any changes in estimate. The full text of these three paragraphs is presented in Appendix D.

In order to formalize these three paragraphs, the FASB would have to clearly delineate those areas that are to be left to the judgment of practitioners, which must follow one of a set of predetermined options, and which are completely automatable, involving no judgment whatsoever.

Conclusions

The goal is not the formalization of standards as they currently exist. Rather, it is a fundamental shift in the manner in which standards are developed. To formalize what has come before is currently the task of third parties. At some point between the presentation of a rule and its implementation into computer systems, someone has bridged the gap between unformalized prose and formal computer language. The standard setters are currently not accomplishing that task, leaving the job to software vendors or in-house computer professionals at accounting and industry firms. Given the volume of clarifications issued, it is safe to conclude that current standards are inadequately precise.

The ideal framework would involve simultaneous standards development and formalization. If formalization accompanies the development of a standard, the chances for unintended ambiguity will be greatly reduced³. The FASB will become its own feedback loop, as experimental implementation of a new, formalized standard will reveal those areas of the standard that exhibit some vagueness. Upon determination of these

³ The formalization of standards would have many unforeseen consequences which are beyond the scope of this paper. The IFRS concept of principles-based accounting is diametrically opposed to formalization.

ambiguous areas, the FASB will then have to decide whether it wants to re-write the standard in a clearer fashion, or to highlight the area in question as a matter better left to the judgment of individual firms.

Moving towards an inevitable future

The processes of business activity measurement and standard setting have substantially diverged. While practical business measurement has evolved into a diverse set of computer applications supporting specific business decision needs, standards for business reporting have remained an anachronistic level, residual of business past. The degree of precision and formalization necessary for the implementation of accounting standards in computer systems often is often found lacking in published standards which are the result of compromise and wordsmithing. The substantive confusion and frequent reversals observed in standards, such as those dealing with leases, pensions, and derivatives, is not a reflection of incompetence by standard setters. Rather, it is a reflection of a counterintuitive and counterproductive standard setting practice.

Statement of ambiguities

Financial accounting standards, like legal statutes, are full of ambiguities that are left for professionals to clarify, interpret, and/or operationalize. These ambiguities come from a variety of sources such as unclear problem definition, a wide variety of applications, compromises among different interest groups within standard setting bodies,

and the classic “principles” versus “rules” approaches to standard setting.

While I cannot expect this paradigm to obliterate all ambiguity within GAAP, one benefit of such thorough formalization is a clear demarcation between what is and is not left to human judgment. Computer code cannot tolerate unaltered ambiguity; therefore, one research concept which I hope to see included in a later paper is that of a statement of ambiguity, or a set of “ambiguity objects that more clearly specify the nature, extent, and scope of the issue. If standards are to be pseudocoded, gray areas within them will become clear in a manner impossible to achieve within the comparatively wide boundaries of ordinary prose. By acknowledging the presence of ambiguities in an accompanying ambiguity statement, the FASB will

- increase awareness of the limited ability of GAAP to cover all areas of business activity,
- highlight directions for potential future regulatory action by calling attention to those areas in need of further thought and discussion, and
- heighten the stature of the accounting profession by enhancing the public’s perception of openness.

I do not mean to suggest that ambiguity is uniformly negative or harmful. In fact, the art of prudent decision making in the face of ambiguous circumstances is a hallmark of the accounting profession. However, if code is to be formalized, a clear distinction must be made between those judgment tasks that can be completely automated and those

that require at least some consideration and input by human beings. Determining these distinctions may prove to be a useful aim itself, one beyond the scope of this position paper.

Movement to principles-based accounting

The concept of formalization requires a framework that is fairly rigid in execution and structure. As the developed world (especially the US) converges on a more principles-based accounting concept, it would be prudent to determine whether a formalized structure can be imposed upon what seems at first to be an under-formalized paradigm.

Before that analysis takes place, we must consider the extent to which US accounting standards are already rooted in principles. (Schipper 2003) argues that many US standards, although composed of rules of significant specificity, are nonetheless based on fundamental principles. Rules-based standards, then, would depend on a cohesive set of fundamental principles in order to be coherent, consistent, and reliable.

Pure principles-based accounting, by definition, places a great deal more trust in the statement preparer's judgment than does pure rules-based accounting. The benefits of standards formalization will therefore be limited to the extent to which that judgment is automatable. However, we must keep in mind that firms in principles-based nations use computer systems just as readily and completely as those operating under rules-based

systems. We must also keep in mind that there is no such thing as a purely principles- or rules-based system. The question is not whether we can apply formalization to a principles architecture, but rather how it would be best accomplished. The necessity of formalization lies not in its conformity with one set of regulations or another, but in its ability to create and maintain greater harmony with practice at actual organizations. The move to principles-based accounting is not an excuse to avoid formalization, but rather a challenge that can and must be met if current standards promulgation practices are to advance into the 21st century.

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3. Standards implementation: practice and impediment

The nature of standards implementation

The accounting standards currently used by publicly traded companies in the developed world are issued in a prose format. While other legal documents are meant to be interpreted by human beings, and are thus well suited to a human-readable, unstructured format like prose, virtually all of modern accounting is done with the assistance of computers, databases, and other electronic systems. These systems cannot natively read prose standards, and therefore translation must be accomplished before accounting standards can take effect.

This paper is concerned with the methods of standards implementation employed by various business firms. Information theory (Shannon 1948) suggests that the transformation of data from one form to another (e.g. freeform, prose accounting standards to rigid computer code) will increase entropy and cause a loss of data. In this paper, I propose to examine the methodologies employed by firms to implement accounting standards. The costs and concerns I discover, both pre- and post-implementation, are a valuable insight in its own right, and also provide further motivation and justification for urging the FASB to consider standards formalization. Reduction in entropy will yield more uniform results downstream, reducing the high cost of re-implementation upon the discovery of misapplied accounting standards, and the high social cost of unaddressed diversity in standards implementation.

Literature review

Heterogeneity

An area of great concern to this study is heterogeneity, either in a firm's set of systems themselves, or in the implementation of standards within those systems.

Systems

One of the most critical challenges to any form of software improvement is the lack of interoperability of different systems within an organization, especially in the case of older, legacy systems. (Bullinger et al. 1998) state: "The ability to integrate legacy systems in a company-wide IT architecture is a precondition to act in a global market." (p 2997) While their study is concerned with the data processing needs of a technical product manufacturing company, their findings remain applicable to this study. "Comparability exists, but because of the large differences in terminology, content, format and references, an exchange of such information is not possible." (p 3000) This concern regarding legacy systems, and a variety of proposed solutions, are echoed by many other studies (Kamal et al 2011, Porter et al 2004, Akyuz and Rehan 2009, Adams et al 2009, Coyle 2000, Wang and Zhang 2005, Elgar et al 2004)

This difficulty is of particular concern because heterogeneity in systems architecture may facilitate heterogeneity in standards implementation. If systems lack adequate capacity to describe accounting data in a manner that is interoperable with other systems, the quality of financial statements based upon such data will necessarily suffer.

Standards, principles, and rules

A large body of academic study has already been devoted to the analysis of principles-based accounting and its effect on firms' financial statements and real behaviors.

Nelson (2003) provides a thorough review of literature on the behavioral implications of the implementation of accounting standards, distinguishing between principles- and rules-based standards. Nelson notes that all US accounting standards are written in support of the FASB's conceptual framework, which is essentially a set of principles. Any additional standards, he argues, will only be as precisely worded as necessary to support the framework. Rules, therefore, are optional and incremental additions to the fundamental principles of any conceptual accounting framework, and not an alternative form of standards presentation. This "incremental" perspective allows a focus on the effect of additional rules on the precision and complexity of a standard.

Additionally, Nelson (2003) notes that the incremental perspective allows rules to be placed along a continuum, with some (like probability estimates) involving more judgment and fewer rules, and others (like lease accounting) being much more strictly defined and rules-based. Rules can be used to perform one of two functions: communication or constraint. Communication refers to the use of a rule to convey the essence of the guiding principles behind a new standard. Constraint, meanwhile, serves to limit the application of a rule up to a certain limit in an effort to constrain overzealous or aggressive application. A formalized framework would necessitate clearer definitions for

rules, if not greater rule density per standard, in order to carry these two roles out.

Kadous et al. (2003) and Hackenbrack and Nelson (1996) note that when an auditor is predisposed to accept a client's preferred accounting methods, it will exploit ambiguity in reporting standards, either through exploitation of vaguely worded quality benchmarks or simple arbitrary judgment, to find a client's choice of accounting method to be valid. However, post-SOX research (Joe et al. 2011, Agoglia et al. 2011, Hwang and Chang 2010) show that this dynamic is changing to favor increased conservatism, especially in the presence of more principles-based standards. These studies indicate that firms with experience in negotiating figures on financial statements may wish to avoid statements that contain ambiguity or place a heavy emphasis on judgment.

Plumlee and Yohn (2010) perform a comprehensive study of the fundamental causes of restatements. Their study notes that when restatements are caused by application of accounting standards, lack of clarity in the standard and misapplication of judgment when applying the standard account for a total of 95% of such restatements.

H1a: Increased mention of ambiguity is positively associated with negative tone.

H1b: Increased mention of judgment is positively associated with negative tone.

Extant scholarly research involving comment letters addressed to accounting standards boards is sparse at best, and tends to focus on the decision *to* compose such a letter based on membership in certain groups (Koh 2011), and particularly on the participation of academics (Tandy and Wilburn 1996).

A notable exception to this ostensible lack of research is Saemann (1999).

Focusing on the most controversial standards (as measured by volume of comment letters submitted), the author employed coders to categorize the nature and concerns of comment letters written by interest groups representing different parties, and determined that preparer-centered interest groups tend to lobby against costly disclosures and any requirements associated with greater earnings volatility.¹ This prior literature leads to the hypothesis that concerns regarding complexity and cost are likely drivers of negative attitudes toward a given accounting standard.

H1c: Increased mention of complexity is positively associated with negative tone.

H1d: Increased mention of cost is positively associated with negative tone.

Standards in related fields

The problems related to internalization of external standards are by no means restricted to the field of accounting. Lessons learned and solutions observed from other fields will guide the progress of this study.

Business

As discussed by (Edwards and Coutts 2005), the improvement of a business process can be significantly hindered by systems heterogeneity. The authors propose the use of a domain machine, in this case UML, to simplify the creation of new systems. A domain machine will enable a singular, abstract system to be mapped onto the various

¹ Conversely, Saemann (1999) finds a simultaneous user bias in comment letters submitted by user-oriented lobbying groups (e.g. the AICPA).

legacy systems embedded within a given framework. This has the value of streamlining future standards implementation on a conceptual level, enabling an implementation team to concern itself solely with the task of ensuring adequate representation of the standard in one universal system, confident that it will then automatically be applied to the broader IT infrastructure.

Software implementation/change management

The impact of a given accounting rule change on a firm can run the gamut from trivial to tremendous; on the larger end of the spectrum, it is possible for a firm to spend a great deal of effort ensuring compliance with a new standard. Several studies indicate that a variety of human factors influence the speed and effectiveness of software change implementation within firms.

(Herbsleb and Mockus 2003) study a midsize telecommunications firm via survey and observation and find that distributed, multi-site software change projects introduce substantial delays: “Two independent analyses of [modification request] data, taken from different organizations, with different people, different locations, and building very different kinds of software, show remarkable similarity in all relevant respects... requir[ing] an interval of about 2.5 times longer than... at a single site.” (491) The largest single factor in these delays appears to be an increase in the number of human beings involved in the work, suggesting that communications and coordination are hampered across sites. This work has powerful implications for the proper implementation of accounting standard changes, especially in the case of decentralized change management. The authors’ findings are echoed by (Herbsleb and Grinter 1999) and (Herbsleb, et al.

2001).

A recent survey (e.learning age 2006) indicates that a third of IT professionals in Great Britain believe that a lack of end user understanding is a key problem when rolling out new software. A related survey of IT directors (Touchpaper 2006) indicates that 70% find the frequency and number of changes to software configurations to be a central challenge to IT management. 50% find human error similarly challenging, and 44% are challenged by end users making their own changes to IT software. If such phenomena are as prevalent in the implementation of accounting standards as they are in the rollout of new software, this study will be all the more salient.

Other industries

Goud et al (2009) discuss the benefits of formalization in assessing and confirming the structure of clinical practice guidelines. They assert that the parallel development of standards concepts and their formalization yield several benefits, especially in terms of the consistency of their application.

(Raslan and Davies 2006) perform a study on the capability of British construction firms to adapt to the energy performance standards promulgated by the UK Building Regulations of 2006. After an in-depth, two-stage survey, the authors conclude that stricter regulations have led to greater task specialization, but an inadequate level of change on the part of industry. Among their key findings are:

- “A lack of integration of energy performance prediction in the design process.”
- “Inadequate use of quality control procedures to ensure compliance results

credibility.”

- “A lack of provisions for enforcement measures such as mandatory on-site inspections.”
- “A lack of clarity and consistency of approach in the enforcement of the methodology.”

These findings may likely exhibit relevance in any profession tasked with assurance of standards implementation. As ambiguity and a focus on judgment grow, implementation is likely to be more haphazard and less uniform, especially in the absence of adequate enforcement.

Accounting standards

Current FASB lease accounting

At the moment, a large focus of standards changes is centered on lease accounting. The current FASB-issued standards require leases to be treated as either *operating* or *capital*, depending on certain criteria. Under an operating lease arrangement, the lessor retains possession of the leased asset on its balance sheet, and the lessee treats periodic lease payments as expenses on its income statement. Under a capital lease, the asset is considered to be transferred from lessor to lessee, with a corresponding liability required to be paid down over the life of the asset.

The four bright-line criteria for lease classification are as follows²:

1. Ownership. Ownership of the asset transfers to the lessee at termination of the lease.

² ASC 840-10-25-1.

2. Bargain purchase. The lease terms allow the lessee to purchase the asset from the lessor at a significantly reduced price.
3. Estimated economic life. The lease term is equal to or greater than 75% of the estimated economic life of the asset.
4. Fair value. The present value of all lease payments represents at least 90% of the fair value of the asset.

If at least one of these criteria is met, a lease is classified as capital; otherwise, it is an operating lease. Reassessment is required in the case of any change in the provisions of a lease, excepting renewals and extensions.³

IFRS lease accounting

IAS 17, the IASB's major pronouncement with respect to leases, details a more principles-based approach. The IASB classifies leases "based on the extent to which risks and rewards incidental to ownership of a leased asset lie with the lessor or the lessee."⁴ If risks and rewards associated with a leased asset are substantially transferred to the lessee, the lease is classified as financing (capitalized, on-balance sheet); else, it is classified as operating (non-capitalized, off-balance sheet). IAS 17 provides several examples of lease capitalization criteria, including items largely equivalent to the FASB's four current bright lines, among others.⁵ IAS 17 notes that such classification criteria are *not* strict rules; if the lease does not transfer substantially all risks and rewards *despite* meeting one or more of the suggested criteria, it may still be classified as operating. While the current set of FASB classification requirements can be easily classified as

³ ASC 840-10-35-4.

⁴ IAS 17, Paragraph 7.

⁵ IAS 17, Paragraphs 10-11.

rules-based, IFRS requirements are not so clearly positioned on the principle-end of the spectrum. Rather, there seem to be a set of rules (in the form of examples), with some allowance for deviance with proper justification.

Proposed joint FASB-IASB lease accounting standard

Project 1850-100, which produced the exposure draft detailing the proposed lease accounting standards change, would replace the current scheme with a universally applied⁶ capitalization scheme, requiring lessees to recognize a right-of-use asset equal to the discounted value of the largest lessee-determined rent payment liability that is deemed more likely than not to occur. Notably, this scheme requires revaluation of lease liability whenever facts and circumstances change. Lessors, meanwhile, are obligated to divest their balance sheets of the leased asset to the extent that they no longer bear significant risk associated with the asset.

Noteworthy changes

Should the FASB/IFRS team move forward with this set of changes, several changes will be made:

- All long-term leases will now be capitalized by the lessee. This will necessarily result in a reclassification of any heretofore operating lease, bringing its associated liability and asset values onto the balance sheet. Several studies (Duke et al. 2002, El-Gazzar et al. 1989, Abdel-Khalik 1983) indicate that companies have incentive to structure leases to keep related liabilities off the balance sheet, thereby improving the appearance of several key debt ratios.

⁶ For all leases with a term longer than one year. Leases of a shorter term may continue to be treated as operating leases.

- Initial valuation of a lease will include additional items like contingent payments (e.g. additional payments if a leased machine is used to produce beyond a certain number of units) and optional renewal periods.
- The valuation of each and every lease will now need to be reassessed when “facts and circumstances” change, and not simply when lease provisions are manually altered.

Methodology

Pre-implementation: Interviews

To gain a proper understanding of the nature of standards implementation, it is necessary to get a “ground level” perspective from individuals heavily involved in the implementation process. To that end, I cast a wide net, requesting information from every member of the S+P 500 and further engaging those who responded with offers of information. The interview was semi-structured, aimed at determining both common and best practices regarding standards pre-implementation activity. The skeletal structure of the interview is as follows:

1. What were/are the major issues regarding your anticipated implementation of lease accounting standards?
 - a. How long did it take for you to achieve satisfactory implementation?
 - b. How much effort was involved in the pre-implementation activity?
 - i. How many people? For which department(s) do they work?
 - ii. What resources did you require?
2. How closely is your auditor involved with your lease accounting decisions?
3. How are you preparing for the proposed changes in lease accounting standards?
4. How do you expect the new standards to affect your financial statements?
5. What are your chief concerns regarding the proposed lease accounting changes?

Post-implementation: Comment letters

Since implementation of an as-yet unmandated standard cannot have occurred, I have no capacity to learn about real activity. Instead, I have chosen to analyze comment letters submitted to the FASB/IASB regarding the exposure draft outlining proposed lease accounting standards changes.

In the exposure draft, the boards request general comments on the proposal and ask a total of 19 specific questions about various issues. Responding companies may choose to offer general commentary, answer some or all of the questions, or both.

To quantify these concerns, I have generated lists of related words culled from Princeton University's WordNet, a system designed to disambiguate given words, articulate their various meanings, and provide synonyms based on each meaning. WordNet has already been used to develop document clustering techniques (Zheng et al. 2009), automatable semantic relationship detection between words (Girju et al. 2010), and corpus-related ontologies for the purpose of document data extraction (Zheng et al. 2009). Lists of synonyms are as follows:

Ambiguity: ambiguous, unclear, vague, equivocal, uncertain, ill-defined, confusing, obscure, indeterminate, perplexing

Judgment⁷: opinion, estimation, estimate, interpretation, assessment, assess, approximate, forecast, subjective

Complexity: complex, complicated, complicate, intricate, labyrinthine

Cost: toll, expense, expensive, burden, onus, onerous, load, effort, labor, work, task

Note that for the cost set of synonyms, the words “cost” and “expense” were removed from the final test, as they possess special and specific accounting definitions which will likely be conflated with the meanings which I intend to seek out.

To determine the level of negativity associated with a given comment letter, I employ the Loughran-McDonald (2011) negative word lexicon. This is a dictionary of 2,327 negative words⁸ that tend to imply a negative tone when used in a financial context. This dictionary has already been used in a variety of research items, ranging from an analysis of disclosure tone and litigation risk (Rogers et al. 2011), to a prediction of firm performance based on conference call verbiage (Mayew and Venkatachalam 2012), to an analysis of IPO prospecti showing that issuers use strategic disclosure to hedge litigation risk (Hanley and Hoberg 2011).

Results

All six firms successfully interviewed expressed a wish to remain anonymous, and will therefore be referred to by ciphers: Alpha, Delta, Epsilon, Gamma, Rho, and Pi.

⁷ Both “judgment” and “judgement” were included in the final word count in order to account for both American and British spelling conventions.

⁸ The entire list can be found at http://nd.edu/~mcdonald/Data/Finance_Word_Lists/LoughranMcDonald_Negative.csv

Pre-implementation

The pre-implementation phase is marked by several elements common among the companies I studied: analysis and modification of capacity, discussion with auditors and/or industry peers, and pro-forma activity. Note that these activities are not sequential, but tend to occur simultaneously. Often, the execution of one element will feed off of information gathered from another.

Analysis and modification of capacity

Analysis

As lease accounting is a data-intensive effort, companies with significant amounts of leased assets typically employ dedicated database systems, maintained either in-house or offsite, to maintain lease data.

Corporation Delta has purchased the services of a third party, web-based software database management firm. Delta finds that this method allows immediate access to lease information and terms at minimal effort. The managed data includes such items as rates, terms, abatements, and improvement allowances.

Modification

Companies that determine that a modification of capacity is necessary and choose proactively to undertake this level of activity tend to exhibit a high degree of inter-department collaboration. Corporation Epsilon notes that “Once an accounting standard change is issued, this Accounting Research team...will coordinate with IT and the business unit financial teams, so the implementation responsibilities tend to be shared

based on the project plan.” Rho echoes this concern: “It’s more about monitoring the new guidance from the FASB. There’s a project team with an oversight board that reports to the executives. There’s a hierarchy of people tasked with this.” This level of collaboration is necessary during this phase due to the diversity of expertise necessary to properly implement a proposed change affecting all leased assets. Pi has two separate groups, one tasked with interpretation of new standards and the other with implementation. Naturally, the former is populated with a large proportion of accountants while the latter is populated mostly with IT professionals.

Companies will generally follow one of two paths toward capacity modification: in-house or third party. These decisions tend to follow a company’s predetermined choice for lease data management.

In-house

Gamma is an example of a corporation that has chosen in-house modification of capacity. Gamma notes that “most of [our lease data examples] are low volume,” and it therefore chooses to edit relevant Excel spreadsheets directly, creating manual journal entries at period end. Those companies that elect to perform in-house adjustments tend to have very few leased assets, like Gamma.

Third party

A wide majority of companies depend, in whole or in part, on third party software to effect a smooth implementation transition. Rho, for example, uses Oracle and finds it to be quite adequate: “We take the info from the lease and enter it into the software of

Oracle. As long as the data has integrity, everything comes out right.” Rho currently holds between 800-1000 leases and notes that “with real estate, every transaction is different.”

The level of integration between third party representatives and their corporate liaisons varies widely. Some companies tend to be more hands-off, allowing and trusting software vendors to handle the bulk of the load. Alpha uses a piece of software called Costpoint, developed by Deltech. According to an accounting professional at Alpha, “They are the ones who integrate new standards, or...come out with a new process or procedure for you to meet [a changed standard.]” Alpha has one individual tasked with ensuring that the changed software meets the new requirements, reporting to Alpha’s accounting team if success is not realized.

Other companies have more power to directly manipulate software, albeit sourced from a third party. For Delta, the coming changes are not expected to be a problem. Delta’s accounting team engaged in lengthy discussions with the real estate and IT groups, as they would be most likely to be impacted by the rule change. A determination was made that the current system is adequate to handle future changes with minimal or zero capacity modification.

Discussion with auditors and industry peers

In many cases encountered over the course of this study, lengthy discussions between the firm and its auditor preceded any change implementation by a considerable

length of time. This discussion is generally undertaken to ensure that both auditor and client share the same interpretation of the meaning of the proposed standard.

Corporation Delta has recently concluded a series of discussions with its auditor regarding planned implementation of the proposed lease accounting changes. Before Delta's accounting staff presented any implementation plans to the board, the plans were approved and confirmed by the auditor. This is standard practice at Delta. An accounting professional at Delta explained that "auditor discussions are a necessary precondition because of [the auditor's] *influence*. We want to ensure that we have a concurrence in advance, as opposed to needing a solution after the horse has left the barn." (emphasis added)

Discussions between a given firm and its industry peers are undertaken for similar reasons. Rho engages in peer group conferences to find out what other firms are doing, especially when large and complex rule changes are on the horizon. "Divergence is the enemy of consistency," says an accounting professional at Rho, and peer group conferences are a tool to ensure that such divergence does not take place within an industry.

Gamma has actually taken its peer group activity one step further, co-authoring a comment letter to the FASB with other members of its industry. "We did not have a system to deal with the nuances to a contract." The volume of trade group comment

letters sent to the FASB⁹ regarding lease accounting shows that this is not an isolated issue.

Pro-forma activity

To ensure proper real-time execution of a new standard, pro-forma activity is often conducted beforehand to determine both the company's capacity to perform under new conditions and to analyze any significant changes to a company's financial statements and key ratios.

The proposed change in lease accounting is a prime example of the need to recalibrate performance ratios. As most current operating leases will likely be reclassified as capital, several ratios will shift dramatically. Rent expense will now become interest or depreciation expense, and all ratios related to one or the other (e.g. EBITDA) will necessarily be recalibrated.

This change must be effectively and proactively communicated to all parties involved at the earliest possible time, to reduce the shock associated with that shift. This is especially true when a company must communicate a change to investors. An executive at Corporation Delta explains: "It's about how you communicate and manage that message. [We] issue retroactive restatements in order to manage that message. [We] give them pro forma [statements] so they can get more comfortable."

⁹ 142 comment letters written by various trade groups.

Post-implementation

Plans for post-convergence implementation

Firms are beginning to anticipate the paradigm shift that will accompany the US conversion from FASB GAAP, predominantly rules-based, to IFRS GAAP, which is more principles-oriented.

Delta, for instance, currently employs a fairly straightforward approach for achieving auditor approval. “Everything is pretty much rules-based, so these ambiguities occur less frequently. With a move to a principles basis, they could occur more frequently.” Delta anticipates that, in the face of a principles regime, the menu of rules from which to choose will simply grow broader, and any given choice will require greater justification in the face of lawsuits or SEC inquiries.

Pi has a system in place consisting of separate interpretation and implementation groups. The former is populated with accounting professionals and the latter with IT professionals. According to an expert at Pi, having such a system in place allows the impact of a given standard to be more manageable.

Comment letters

Publicly available comment letters are a valuable source of information regarding the perspectives of various interest groups on a proposed standard. The committee’s call for comments typically includes questions related to specific issues addressed in the exposure draft. A total of 19 questions were posed in the FASB/IASB’s publication regarding lease accounting changes, although respondents were not obligated to address

specific questions in their responses. At present, 786 comment letters have been published regarding Project 1850-100, authored by accounting firms, industry firms, trade groups, government associations and agencies, CPA associations, and other groups and individuals. As I am currently interested in industry response to accounting changes, only letters from individual corporations are to be analyzed. The following details the selection process¹⁰:

Total:	786
Authored by individual industry firm:	250
Less: Non-machine readable responses	(9)
Final sample:	241

These comment letters address a wide range of concerns with the proposed changes ranging from the pragmatic to the theoretical. Several of those issues relate directly to either initial implementation or subsequent use, and they are discussed below.

Question 17

A significant percentage of respondents (79.3%) chose to respond to question 17, the only question posed that directly addresses the cost/benefit analysis of implementation.¹¹ Out of this total, most responses were either mixed (21.9%) or fully negative (74.4%).

¹⁰ All public comment letters may be read and downloaded at:
http://www.fasb.org/jsp/FASB/CommentLetter_C/CommentLetterPage&cid=1218220137090&project_id=1850-100

¹¹ “Paragraphs BC200 – BC205 set out the boards’ assessment of the costs and benefits of the proposed requirements. Do you agree with the boards’ assessment that the benefits of the proposals would outweigh the costs? Why or why not?”

Deviations from the FASB's perceived cost/benefit analysis fall into several categories:

Initial implementation costs are too high.

The administrative burden arising from implementing the model outweighs the benefits for real-estate investment companies that have large volumes of leases in different jurisdictions and with different terms. It would imply costly change to management reporting. – Klepierre

We believe it is a “given” that it will be expensive and operationally challenging for companies to effectively implement the proposed Accounting Standards Update. – Select Comfort

The primary concern voiced in response to question 17 relates to initial implementation costs. Many firms voice the opinion that the FASB has not fully considered all the necessary costs of initial implementation. These perceived additional costs fall under a variety of categories.

- a. Initial lessee classification. Every lease held by a lessee, regardless of its relative size, will need to be classified at the inception of this new standard. This classification includes multiple criteria, including the separation of sales/purchases from leases, the separation of service contracts from underlying asset leases, valuation of both service and lease components.

b. Initial lessor classification. Lessors will likewise need to determine lease classification (performance obligation liability vs. derecognition) and change sale recognition calculations on a lease-by-lease basis. Pitney Bowes, for example, claims

...a portfolio of almost 900,000 lease schedules that on a portfolio basis perform in a reasonably predictable manner over time. The costs to implement a reassessment process, in a well controlled environment on a global basis would be exceptionally costly.

Among these costs, Pitney Bowes lists

1. Modification of accounting systems to make “catch up” adjustments resulting from assumption changes;
- ii. Creation of processes to analyze underlying assumptions, calculate the necessity and value of adjustments, and document and support either adjustments made or the lack of adjustments.
- iii. Modification of systems to account for multiple potential lease terms, including renewal options. “This will be a difficult change as accounting and customer terms were previously linked and that conceptual framework is most likely embedded in the underlying ‘architecture’ of lease accounting systems.”

Ongoing reassessment will be too costly, effort-intensive, and/or haphazard to be effective.

The idea that a lessee can determine the materiality of the result of changing estimates without doing all the work to calculate the impact of changed estimates is wrong. Once they have done the work to determine the size of the adjustment they might as well book it. – Leasing 101

The vague “facts and circumstances” criterion the joint committee has replaced an easily detected and analyzed criterion (actual change to lease provisions) in determining future lease liability.

Retrospective application will likewise be extremely costly and irregular.

[Retrospective application] would lead to arbitrary decisions due to the hindsight that would inevitably be employed on outstanding leases as of the effective date. Additionally, applying these decisions to each and every lease and lease action would be extremely costly and highly speculative. – AIG

Following the same logic applied to prospective, future lease applications, the use of the new standard to reevaluate past lease transactions will be fraught with similar complexity and irregularity. Compounding the issue is the fact that these leases were undertaken without a view toward future standards ambiguity, and it is possible that key elements of a given lease may not have been recorded in a company’s accounting system, leading to either a time consuming verification process or a haphazard estimation procedure.

Covenants and other metrics may be altered, possibly impacting real business activity.

If the elements of the ED are adopted, lessees will be subject to generally

accepted accounting principles that are inconsistent with those in place when such covenants were adopted... This consequence could be grave for many debtors. While a response may be that debtors will simply need to approach their banks, bond insurers or bondholders, there are very real economic implications. For any debtor to approach a bank or bond insurer, particularly in these economic times, allows the debt holder to insist on changes to fees, rates or covenants. In our case, we can give testimony to the difficulty and cost of these negotiations. – Bon Secours Virginia

While the goal of accounting is to report business activity, and not to alter it, the movement of leased items from the income statement to the balance sheet will necessitate a recalibration of many financial ratios and the potential for violation of previously determined debt covenants. The addition of these liabilities will negatively affect any firm's debt-to-equity ratio, possibly bringing that firm outside its lenders' acceptable range and leading to costly, time-consuming renegotiation of debt terms, if not an outright recalling of loaned capital. The end result of changes in covenants may well be a change in real activity, forcing firms to act more conservatively or to accept less advantageous debt restrictions in order to secure financing for operations.

Benefits to shareholders are negligible or minimal.

We are concerned that investors and analysts of public aircraft leasing companies will not find the income statements under the ED more useful. We believe that these changes will make the income statement less informative. – Aircastle

The proposed standard may harm the usefulness of financial statements,

principally by altering consistency. As GAP notes, implementing the reestimation approach would “inherently reduce the reliability of such estimates by introducing an unnecessary level of subjectivity.”

Textual analysis

To provide a more structured, quantitative estimate of the level of concern raised due to each of the four aforementioned causes for concern with new lease accounting standards, I have run linear regressions comparing the frequencies of certain synonyms in a given comment letter with its level of negativity. The results found are not uniformly significant, but they are nevertheless interesting and worthy of discussion.

Model

$$Neg = b_1(Amb) + b_2(Jud) + b_3(Com) + b_4(Cos) + \varepsilon$$

Neg = ratio of negative words to total word count

Amb = ratio of ambiguity words to total word count

Jud = ratio of judgment words to total word count

Com = ratio of complexity words to total word count

Cos = ratio of cost words to total word count

Public = whether or not the company is public (dummy variable: 1 = publicly listed, 0 = private)

Ratios were used instead of raw word count to control for differences in comment letter lengths. Public was used as a control variable. Since public companies are subject to greater scrutiny, especially regarding application of accounting standards, a publicly listed company may view any proposed change with greater negativity than an otherwise

equivalent private firm.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Amb	241	.000000	.006603	.00085779	.000872947
Jud	241	.000000	.016512	.00439390	.002682539
Com	241	.000000	.012821	.00139743	.001959523
Cos	241	.000000	.008571	.00147021	.001296281
Neg	241	.005699	.029552	.01560984	.003883262
Public	241	0	1	.67	.472
Valid N (listwise)	241				

Figure 1: Descriptive statistics.

Descriptive statistics show that, on average, judgment words were used with far greater frequency than complexity or cost words, which were themselves used more often than ambiguity words. If we associate frequency of word use with intensity of concern, we may say that cost and the use of judgment are of primary concern to the average commenting company. 2/3 of companies authoring comment letters are publicly listed, which is a far lower figure than anticipated, given that FASB/IASB rules are intended primarily for public companies. While a few of these firms are nonprofits (e.g. Phoenix Children's Hospital), a likely explanation is that many of the private firms perform leasing services (either leasing of assets themselves or lease data management) to public companies, and therefore have some interest in future lease presentation, albeit a more indirect interest.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.423 ^a	.179	.162	.003555138

a. Predictors: (Constant), Public, Com, Amb, Cos, Jud

Figure 2: Model summary.

Overall model fit is positive (adjusted $r^2 = .162$), indicating that the concerns I have analyzed do contribute in some manner toward the negative tone of a letter. Descriptions and discussions of individual model elements follow.

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.013	.001		22.813	.000
	Amb	.106	.279	.024	.379	.705
	Jud	.316	.096	.218	3.280	.001
	Com	.112	.118	.056	.948	.344
	Cos	.849	.192	.283	4.415	.000
	Public	.000	.000	-.028	-.462	.644

a. Dependent Variable: Neg

Figure 3: Coefficients.

H1a: Ambiguity

H1a is *not supported*. In addition to representing the lowest level of quantitative concern, ambiguity also appears to have the lowest effect on negative comment letter tone ($p = .705$). This may be for several reasons, including an overlap with concerns regarding judgment and the potential for ambiguity to lead to greater manipulation of accounting data, which may be viewed as an offsetting positive.

H1b: Judgment

H1b is *supported*. Judgment is shown to be a significant predictor of negative tone ($p = .001$). A firm's perceived requirement to exercise independent judgment is a source of consternation, likely due to the fact that such judgment leads to heterogeneous application of a standard, more likely disputes with independent auditors, and broader vulnerability to litigation.

H1c: Complexity

H1c is *not supported*. As with ambiguity, complexity is not a significant predictor of negative tone ($p = .705$). This may be because concerns regarding complexity overlap with and are overshadowed by more significant concerns about judgment and cost, or because the standard itself is not seen as complex. This test is not adequate to distinguish between concerns about complexity of the standard and concerns about the complexity of its implementation, and I can only speculate as to the causes of this lack of concern.

H1d: Cost

H1d is *supported*. Concerns regarding cost are the most significant ($p < .001$) and strongest ($b = .849$) predictor of negative tone. Given prior literature, this is not a surprising result. Firms' primary objection to changes in standards relate to the costs associated with implementation of that standard, both in the short- and long-term.

Public (control variable)

The control variable, a dummy identifying a firm as public (1) or private (0), appears to have no significant effect on a company's negative tone. This supports my

theory that private firms authoring letters to the joint committee likely have a vested interest in the outcome of standards decisions due to their relationships with publicly traded companies. It is also possible that these firms are required to follow GAAP despite their private nature due to various stakeholder requirements and provisions.

Alternative dictionary

As a further control measure, I used the standard negative tone dictionary included with LIWC (Linguistic Inquiry and Word Count) software to generate an alternative Neg score. Using this dictionary resulted in a lack of any statistically significant result. The specialized nature of business terminology is likely to blame for this discrepancy. Words like “hate” and “enemy,” included in the LIWC dictionary, are unlikely to be included in a comment letter or any official public correspondence. Conversely, words like “antitrust” and “litigant,” included in the Loughran-McDonald set, may not have negative overtones in non-business contexts.

Conclusions

The implementation of an accounting standard, especially one with as far-reaching consequences as lease accounting, naturally attracts a great deal of attention from firms affected by the change. This study is an attempt to show how firms anticipate changes, what they do to prepare, and what their chief post-implementation concerns are.

Semi-structured interviews reveal a three-stage, redundant set of activities involved in pre-implementation activity: analysis and modification of capacity,

discussions with industry peers and audit firms, and pro forma activity. A firm's decision to participate in all, some, or none of these activities seems to be motivated in part by the perceived likelihood of the standard being promulgated in its present form. Firms that anticipate a published standard similar to the exposure draft will discuss their planned responses with auditors and peers, survey their technical and human capacity to handle the change, and possibly develop a new set of statements as if the standard had already been enacted. Proactive firms also tend to have more confidence about the future than firms that choose to take little or no action.

Analysis of comment letters shows that firms that chose to comment on the proposed standard likely did so due to concerns about either cost or the greater requirement to apply human judgment. Concerns about ambiguity and complexity were not significant factors. The primacy of cost and judgment concerns are at odds with a growing trend toward more principles-based accounting standards in the United States and abroad, especially with the advent of the IFRS/US GAAP merger.

Limitations and directions for future research

The greatest limitations of this study are the samples used. While a wide net was cast when seeking interviews regarding pre-implementation activity, few companies chose to respond, and even fewer allowed a one-on-one interview with staff involved in the implementation process.

The choice of comment letter analysis has proven interesting and fruitful, but it does suffer from self-selection bias. There were no letters of outright praise found among

the population of letters analyzed, and it is possible that there is a subset of firms that find the new standard acceptable, and therefore not worthy of comment.

That said, I hope to use this method of analysis in future papers. Questions for future research include:

- How well do standard-setting bodies listen to comment letters? Will we see a substantial change in the final version of the new lease accounting standard?
How were past exposure drafts influenced by subsequent comment letters?
- Can we use comment letter volume or tone to predict future standards-based restatements?
- Can we associate the nature of a standard (e.g. along the principles-rules continuum) with the volume and tone of associated comment letters?

As analysis continues, these questions will be addressed in greater depth.

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4. Toward the development of a high-level lease accounting standards domain ontology

In 2008, the SEC's Advisory Committee on Improvements to Financial Reporting (ACIFR) released its final report on improving the usefulness and decreasing the complexity of the financial reporting system. The report's main chapters contain recommendations for improvement in each of four areas: substantive complexity, the standards-setting process, the audit process and compliance, and delivering financial information. The ACIFR felt that in all of these areas, improved usefulness and reduced complexity could benefit all users of financial statements, particularly investors. In its 172-page report, the ACIFR recommends a variety of substantial changes to current accounting standards generation and promulgation methodologies, addressing everything from bright-line rules to accounting treatment alternatives. Among the ACIFR's recommendations:

1. The gradual phase-in and use of XBRL, "so that particular items across companies can be easily sorted and analyzed by investors."
2. The private sector development of key performance indicators "that would capture important aspects of a company's activities that may not be fully reflected in its financial statements or may be non-financial measures."
3. "Formalizing post-adoption reviews of new standards, as well as periodic assessments of existing standards...to provide the FASB with better input during and after the standards-setting process, which should enhance the effectiveness of

the process and make the end product more useful.”

4. “A move away from industry-specific guidance,” to be replaced by “a focus on the nature of the business activity itself, since the same activities... may be carried out by companies from different industries.”

The development of a formalized accounting standards framework will necessitate a reengineering of the universe of business reporting, and must necessarily include the creation and use of a master ontology. “[A]n ontology is a formal conceptualization of a real world, sharing a common understanding of this real world.” (Lammari and Metais 2004) The concept of an ontology is closely related to that of a database, which (Abrial 1974) defines as “the model of an evolving physical world.” A valid ontology contains all items of interest within a given framework, and all valid attributes for each item of interest. Items are described in every detail that has been determined to be relevant.

If FASB-issued accounting standards are to become more directly related to their formal, computerized counterparts, all constituent objects and relationships within the relevant accounting universe must be likewise formalized. This paper represents an initial attempt at such formalization for the purpose of developing parity between accounting standards and the formal environment in which they are implemented. Rather than considering additional attributes to include in the accounting domain, I seek to pare down the ontology to those items that are universally applicable and of greatest concern to statement users. Items that add relevance to financial data are included, while those that

do not are left to be handled by less precise (e.g. text-based) presentation methodologies.

I begin this paper with a discussion of best practices and design concepts, followed by a discussion of methodology, a description of the issues inherent in lease accounting, an attempt to formalize and simplify these issues, a sample implementation, and a discussion of limitations.

Literature review

Explicit imprecision in accounting data

In the 1970s, several efforts were made to analyze the effect of explicit admission and disclosure of estimation variances and imprecision in forward-looking accounting numbers involving some degree of management judgment. In a case study, Albrecht (1976) shows that a firm reporting a net loss of \$6,972 could actually have reported between a loss of \$38,444 and a net income of \$24,497 with 95% confidence.

Oliver (1972) provided range-based financial statements to professional investment bankers tasked with making loan decisions, comparing their investment decisions with a control group that was provided traditional, point (non-range) statements. Subjects were given descriptions and financial statements for two hypothetical companies and enough money to invest in either one or the other, or neither, but not both. It is important to note here that the ranges provided for the experimental group were based on the educated opinions of company management, and not a scientific or (necessarily) rational process. While there were no significant differences in the

investment decisions of the two groups, the experimental group did display a considerable reluctance to lend. The somewhat lackluster result may be due to the fact that seasoned professionals already possess an understanding of the uncertainty present in accounting numbers, and therefore the provision of ranges provided little or no added value. This finding was further emphasized by Bimberg and Slevin (1976) who provide three hypotheses regarding Oliver's results.

1. The additional range data is irrelevant to a user's preexisting decision models. This cause would suggest that confidence intervals are not necessary.
2. The user does not know how to use the data and therefore ignores it or fails to restructure it into preexisting decision models. In this case, greater understanding may lead to better investment decisions.
3. The variability presented by Oliver is consistent with the user's assumptions regarding uncertainty, and therefore no new information was added or could be used. A manipulation of the variability presented might, therefore, produce a significant effect on investment.

To my knowledge, these studies have not been replicated in nearly four decades. During that time, several additional judgment-based phenomena have been incorporated into accounting rules. These include, for example, fair value accounting, stock option expensing, and pension obligations. The potential for uncertainty in net income as an aggregate of the variances in constituent accounting numbers is as high as it has ever been, and as judgment-centered, principles-based accounting standards continue to

propagate, this uncertainty can only increase.

Design concepts

Measurement theory

Mock (1976) establishes a relationship between the world of real objects and events (the Empirical Relational System, or ERS) and the set of numerical relationships devised to report that activity to users (the Numerical Relational System, or NRS). The following figure illustrates this relationship.

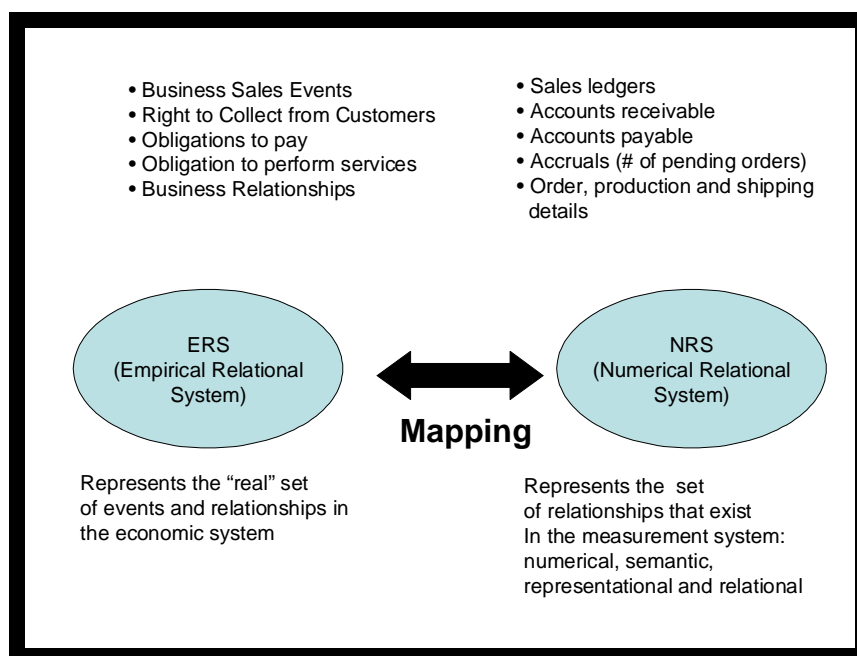


Figure 1: ERS – NRS relationship.

The process of mapping the NRS to the realities apparent in the ERS represents the fundamental effort of accounting. This mapping ability is contingent upon a host of given factors, including: time, valuation basis (e.g. cost vs. fair value), probability, and precision. The current business reporting model, according to Mock, is centered on

historical data, simple computation, and parsimony of disclosed data due to the high cost of disclosure. This leads to a one-size-fits-all statement presentation paradigm that ignores modern computing power, the growing ease of data transmission, and the necessity of estimation for the valuation of future anticipated transactions.

Database theory

The rules and concepts applied to the formalized framework of database management are well-suited to a discussion of issues surrounding accounting standards implementation. Several approaches will suggest methodologies for proper software implementation of accounting rules.

E-R and REA (McCarthy 1979, McCarthy 1982)

As I am looking to bring accounting standards more in line with the realities of database-centered accounting, it will be useful to investigate the principles of database design. In his dissertation, (McCarthy 1979) describes the entity-relationship (E-R) model of accounting database design methodology. Database development requires an abstraction of reality that will “remain consistent with itself and maintain its integrity over time.” (p 668) Such integrity will necessarily require a high level of abstraction; the terms and concepts used must be adequately broad to describe the transactions within an entire universe – in this case, the universe of potential business transactions and balances – while remaining specific enough to retain descriptiveness and relevance. E-R describes the physical transactions within a small example firm for the purpose of database modeling. This model and its successor, the REA model, are developed from the perspective of a single enterprise, with the central intention to provide “information about

two matters of substance: (1) the economic states of the enterprise, and (2) the events occurring over time that alter those economic states.” Examples of E-R relationships are presented in Table 1:

Type	Entity	Relationship	Entity
Event-Event	Sale	fills	Order
Agent-Event	Customer	made to	Sale
Object-Event	Cash	flow of	Cash receipt ¹

Table 1: Sample E-R relationship sets.

Table 1 is clearly not exhaustive, but it is important to note that there is not perfect parity between the concepts of E-R and those of GAAP. GAAP is concerned more with presentation than description, and with representation more than with modeling.

(McCarthy 1982) extends and refines this approach with the REA (Resources, Events, Agents) construct, asserting that every transaction within the accounting framework is a function of the exchange of multiple resources between multiple agents over the course of one or more events. Any REA transaction can be diagrammed as a function of the specific elements involved, and their relationships to one another. Figure 2 provides a brief example.

¹ Adapted from (McCarthy 1979 p 671)

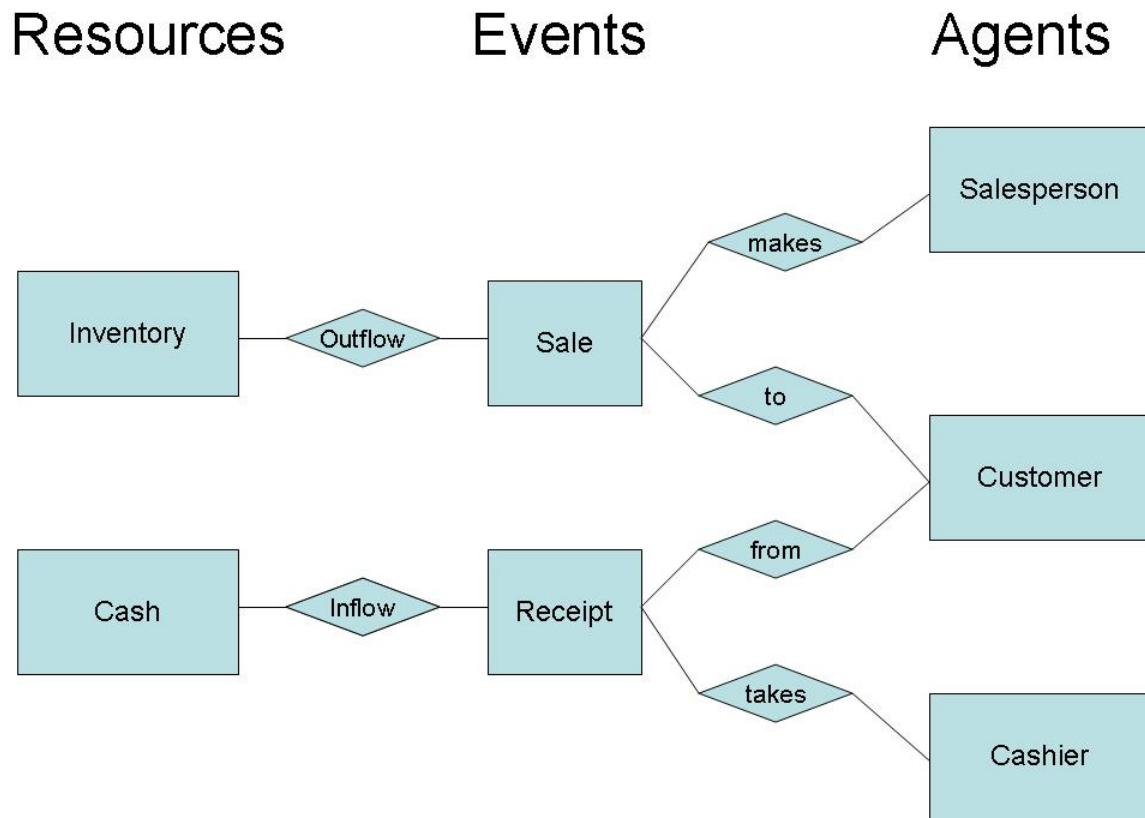


Figure 2: Sample REA diagram.

The value of McCarthy's approach is its recognition of the necessity of simplicity. By ensuring that the REA framework contains only the most basic of necessary structural elements, McCarthy creates a system within which nearly all business transactions can be mapped. The proposed system must likewise be simple enough to be applied to the vast variety of transactions and balances covered by US GAAP.

Design-by-contract

(Coronato and De Pietro 2010) discuss the nature of distributed, heterogeneous computer systems and the formal requirements for ensuring consistent performance

across these systems: “The design-by-contract [DBC] approach prompts developers to precisely specify every consistency condition that could go wrong and to explicitly assign the responsibility of its enforcement to either the routine caller (the client) or the routine implementation (the contractor).”

A “contract” is defined here as

a condition that the software system must hold... [a] contract carries mutual obligations and benefits: the client should only call a contractor routine in a state where the class invariant and the precondition of the routine hold. In return, the contractor promises that, when the routine returns, the work specified in the post-condition will be done and the class invariant still holds. A failure to meet the contract terms indicates the presence of a fault, or a bug. A precondition violation points out a contract broken by the client. The contractor then does not have to try to comply with its part of the contract, but may signal the fault by raising an exception. A post-condition violation points out a bug in the routine implementation, which does not fulfill its promises.

There is a specific difference between correctness and robustness. Correctness is “the ability of software to perform its exact tasks as defined by their specification.” In other words, given proper input, a perfectly correct piece of DBC software will always return proper output. Robustness is “the ability of software systems to react appropriately to abnormal conditions.” Under DBC, the former is the programmer’s responsibility; the latter is not.

To relate the concept to issue of standards formalization, consider correctness as standards’ ability to govern the reporting of business *as it exists currently*. A robust standards framework would be able to accommodate novel forms of business activity with little or no modification. Here, I am not advocating robustness. Business activity is an umbrella term covering an ever-broadening set of transactions; a perfectly robust system would necessarily be so abstract as to be of severely limited practical value, if

any. I do not even advocate uniformly perfect correctness. Rather, I espouse an environment where standards are either technically and internally correct and automatable, or explicitly require human judgment and intervention.

Comparison of development methodologies:

Over the course of an extensive literature review, four ontology development methods have emerged as most useful for application to accounting standards. They are presented in order of relevance for this purpose. While the eventual development methodology will be unique, the trends and concepts found here will prove informative.

Lum et al 1979

(Lum et al. 1979) suggest that to model a sufficiently complex real-world scenario, three successive phases of data modeling must be undertaken: requirements analysis, view modeling, and view integration.

1. **Requirements analysis.** The requirements analysis phase is a process of discovery of current and future needs regarding the data being modeled. Three questions must be answered in order to complete this phase:
 - Which processes and decisions use data?
 - What are the data elements themselves, and how are they used across processes?
 - What organizational constraints, if any, exist on data use?

Each set of responses given to these questions represents one *view*, and many views must be considered before advancing to the next phase. As an example, consider accounts receivable. A bank may consider likelihood of collectability when making decisions, but the country of origin of a given receivable may be irrelevant. A foreign currency hedge trader, on the other hand, may not give much consideration to likelihood of collectability, focusing instead on local currency.

2. View modeling and integration

After views are collected during requirements analysis, the designer must standardize the views according to a given framework (e.g. REA). At this stage, the basic framework of interactions between data elements begins to take shape. The resulting collection is then integrated into a master framework from which individual views may later be derived.

TOVE (Gruninger and Fox 1995)

The TOVE (Toronto Virtual Enterprise) modeling project, developed by (Gruninger and Fox 1995) is more geared toward business processes than ENTERPRISE. It is designed “to deduce answers to queries that require relatively shallow knowledge of the domain.” (p 1) TOVE development is a six-step procedure. (Note that certain sub-steps have been omitted as they relate to enterprise-specific, action-defining applications that are not relevant for this purpose.)

- 1. Motivating scenario.** There is no need to discover a solution without a problem that can be reasonably articulated. Discussion and description of the scenario motivating the need for ontology is a prerequisite to ontology development.

2. **Informal competency questions.** As a formal ontology has not yet been developed, informal competency questions form the intermediate step between the real world and its ontological representation. What questions must this ontology be able to answer?
3. **Specification in first-order logic – Terminology.** For every informal competency question, objects, attributes, and/or relationships must exist to answer it. Every object within the domain will be represented by a set of constants and variables.
4. **Formal competency questions.** By this stage, the terminology of the ontology has been formally defined, and competency questions can therefore be formally phrased.
5. **Specification in first-order logic – Axioms.** These axioms specify the definitions of terms and constraints on their interpretation. At this point, meaning is attached to objects, and the ontology is thus fully specified, although not implemented.
6. **Completeness theorems.** In this stage, formal conditions for complete answers to the formal competency questions are developed. (For example, Vehicle X is a motorcycle if and only if it contains an engine and 2 wheels.)

ENTERPRISE (Uschold and King 1995)

In their initial work on skeletal ontology development, (Uschold and King 1995) develop a basic outline of ontology development.

1. **Identification of purpose.** The results of a survey of purpose would provide

direction for ontology developers, structuring their efforts going forward. Why is this ontology being built? Will it be used to structure a knowledge base, or will it be application-specific?

2. **Ontology building.**

- a. **Ontology capture.** This step involves identification of key concepts and relationships, creation of precise text definitions for all such concepts and relationships, and identification of terms to refer to such concepts and relationships.
- b. **Coding.** At this stage, the ontology developed in stage 2a will be captured in a formal language, whether that language is preexisting or must be developed concurrently with formalization.
- c. **Integration of existing ontologies.** If there are related, preexisting ontologies, decisions must be made regarding their integration. (This most likely refers to XBRL integration in this instance.)

3. **Evaluation.** At this point, the ontology must be rigorously compared to a given frame of reference and tested for completeness. The frame of reference can be a list of requirements, competency questions, or simply real-world performance.

4. **Documentation.** All assumptions about the world being described must be documented if the ontology is to have widespread effect. It does no good to have a perfectly sound ontology if its assumptions, attributes, and objects are idiosyncratic.

METHONTOLOGY (Fernandez et al. 1997, Fernandez et al. 1997)

(Fernandez et al. 1997) describe their ontology development methodology as a life-cycle, with sequential and irreversible steps along a predefined chain, discussing interrelated states and activities. Their model lists the following phases in order:

1. **Specification.** METHONTOLOGY asserts that at least the following must be included during specification:
 - a. **Statement of purpose.** This includes intended use, end users, sample scenarios, etc.
 - b. **Level of formality.** Ontologies exist along a continuum between informal and rigorously formal, depending on intended use.
 - c. **Scope.** The breadth of terms, their granularity and characteristics must be defined.
2. **Knowledge acquisition.** A variety of techniques can be used to acquire a pre-conceptualization level of understanding of the inner workings of the target domain. “Most of the [knowledge] acquisition is done simultaneously with the requirements specification phase and decreases as the ontology development process moves forward.” (p 35)
3. **Conceptualization.** The knowledge acquired during Phase 2 must be structured. The authors suggest building a complete Glossary of Terms, including concepts, instances, verbs, and properties. As construction advances and new terms are created, they must also be included in the glossary. The glossary must also contain groupings as necessary.

4. **Integration.** At this point, other ontologies become a potential source of definitions and objects. As with the ENTERPRISE model, preexisting ontologies will likely come from the XBRL domain.
5. **Implementation.** At this point, the ontology must be tested in an appropriate environment. The authors recommend the use of:
 - a. **Lexical analyzers** to guarantee the absence of lexical errors;
 - b. **Translators** to port the ontology into target languages;
 - c. **Editors** to add, remove, or modify definitions;
 - d. **Browsers and searchers** to view the library of the ontology and determine appropriate definitions;
 - e. **Evaluators** to detect inconsistencies and redundancies; and
 - f. **An automatic maintainer** to manage future changes to the lexicon.
6. **Evaluation.** This is a technical judgment of the ontology, including verification and validation. *Verification* refers to the correctness of an ontology according to a given frame of reference. *Validation* refers to the representational faithfulness between an ontology and the universe it is meant to represent.
7. **Documentation.** The authors assert that it is not enough to generate a code for the ontology, because that document will give no description of the construction of the ontology. Rather, a document should be created to detail every phase of the ontology building process (e.g. a knowledge acquisition document, an integration document, etc.)

Common themes

These development models share some common elements which I plan to follow

for this initial design.

- Problem definition. All begin with an effort to adequately define the problem. In this case, the problems are a lack of quantitative specification and formal definition within accounting standards, and a lack of language to distinguish between past and future events.
- Problem and solution formalization. My solution will focus on leased accounting, a microcosm of the entirety of accounting phenomena, in the hope that this object demonstration will be later will be applied to the broader universe of accounting standards as a whole. The concept, as will be demonstrated, is to define the items of greatest concern for financial statement users and decide upon their attributes. Notably, I will create a numerical continuum of certainty, resolving the issue of occurrence in the context of either historical cost or fair market valuation, and providing a clearly defined object to be matched to an appropriately designed standards ontology.
- Implementation and subsequent evaluation. I will then apply this newly developed ontology to a real-world lease document acquired from a publicly traded company. I will evaluate the new application for weaknesses and suggest further avenues for growth and improvement.

Development of ontology

Problem definition

While the problem I hope to address is the inherent ambiguity in prose-based

accounting standards, simply advocating a reduction in such ambiguity will not yield an appropriate answer. It is more appropriate to ask, “Where does ambiguity create sub-optimal accounting practices and financial statements?” To answer that question, one can look at current Accounting Standards Updates (ASUs) to determine where ambiguity has required correction.

Issues that have required clarification in the past few years include:

- ASU 2010-02, “Consolidation,” addresses the scope of decrease-in-ownership recognition provisions as provided in Subtopic 810-10. The Update specifically limits 810-10’s provisions to apply only to a business or nonprofit activity transferred to an equity method investee or joint venture, or to an exchange of such an asset for a noncontrolling interest in another entity. The Update was issued because the prior, broader treatment might potentially conflict with gain/loss treatment criteria for other types of derecognized assets (e.g. real estate sales, sale of oil and gas rights, etc.)
- ASU 2010-24, “Health Care Entities – Presentation of Insurance Claims and Related Insurance Recoveries,” clarifies treatment of insurance recoveries and claim liabilities. The FASB issued this clarification because some health care entities were netting anticipated insurance recoveries against related liabilities, while others were presenting the two figures on a gross basis. This ASU clarifies that the former treatment is not GAAP-appropriate, and that the amount of the claim liability should be estimated independently of estimations of insurance recoveries.
- ASU 2011-10, “Derecognition of in Substance Real Estate – a Scope Clarification,” is one of the best examples of this issue. Subtopic 810-10 requires that a

parent deconsolidate any subsidiary in which the parent ceases to have a controlling interest, *except* in the case of a sale of in substance real estate, in which case the real estate would be derecognized. However, there existed a wide diversity in practice regarding the treatment of situations other than the sale of in substance real estate that *could* result in derecognition. ASU 2011-10 deals specifically and exclusively with a parent's loss of in substance real estate via default on nonrecourse debt, concluding that derecognition should only occur when title transfers from debtor to creditor, and not when default occurs. Other non-sale instances of acquiescence of controlling interest in in substance real estate are not addressed.

How can formalization address this issue? The existence of a logical framework during the development of the initial standard may have generated increased awareness of the need to address non-sale acquiescence of real estate property. The appropriate ontology will include different transaction types, each with requisite attributes to be addressed. Sale, for example, might include such basic attributes as sale price, cost of goods sold, purchaser, and item type. Type might only be necessary in those cases where GAAP requires unusual treatment. Sale of a corporate division, for instance, would incorporate different attributes than sale of a manufactured product. More importantly, a sale may include prescribed subsequent accounting events, such as derecognition of item sold and recognition of revenue. Other presentations and figures, such as gross profit, can be easily and automatically derived in a future step, likely to occur during statement generation. Sale of a non-revenue generating item, such as investment real estate, will involve gain recognition rather than revenue recognition.

Default might include a number of identifying attributes that distinguish it from a sale. The amount of debt being cancelled is one such consideration; sales typically do not extinguish debt.

Given the text of ASU 2011-10, the FASB seems to desire a differentiation between the time of default and the time of title transfer. This is typical of a theme common to many accounting standards: a distinction between a fundamental event and the recognition of that event on financial statements. The purchase of prepaid rent, the depreciation of an asset's purchase price, and the accrual of interest revenue are all instances in which the occurrence and recognition of events are placed at different points in time. While this is not always the case (for example, the recognition of service revenue and the purchase of supplies occur and are recognized simultaneously), the distinction between occurrence and recognition is nonetheless critical to accrual basis accounting.

Master list of concepts

It bears repeating that accounting standards are not meant to govern business activity, but only to relate business information to interested parties in a standardized format, supporting business decisions. While ontology-based methods such as E-R and REA are helpful in that their development process provides a good example for my own, I am concerned with different criteria. For example, while a business is understandably concerned with the behavior of its employees for the basis of promotion, fraud prevention, and internal control, it would not be prudent to include that type of information within financial statements. From an accounting standards perspective, the "A" in "REA" is often simply the business itself, transacting with other businesses,

customers, or assorted third parties. In certain respects, this paradigm must necessarily be more aggregated than the proprietary systems currently used by businesses.

Reality and representation

In an environment of limited information availability, mandatorily-issued financial statements may be a user's only source of data regarding the internal activities of a firm. With the advent of low latency techniques like continuous auditing (Kuhn and Sutton 2010) and high-granularity (Vasarhelyi et al 2012) technologies like XBRL, I am moving away from such a limited environment. The chronological and qualitative lines between actual events and objects and their recognition on financial statements may become blurred, making adequate, accurate, and timely description of an event all the more critical.

Events and objects

The existence of objects and the occurrence of events are frequently separate from their recognition on the balance sheet and are contingent upon a variety of triggers and/or thresholds. Events must therefore be represented in the ontology in a manner such that these thresholds can be easily identified and quantified. Later work will deal with this concept on a broader scale.

Accounting standards are concerned with recognition, generally with thresholds and amounts. The criteria for recognition of a given transaction are of critical importance to the reporting of business activity. These include timing, method, certainty, valuation, and discretion.

Timing

The point at which revenues and expenses are recognized is discussed at length within accounting standards. The accrual basis allows for (but does not necessarily force) the chronological separation between the occurrence of an event and its recognition. Prepaid expenses, for example, are incurred differently on a cash basis than on an accrual basis.

Chronological distance between two related events may also lead to an altered state of recognition of a given phenomenon. The separation of the receipt of consideration and the provision of goods or services by a company serves as an illustration. If payment precedes provision, an unearned revenue (liability) account is credited, to be resolved at such time as services are rendered and/or products are delivered.² If the two occur simultaneously, the asset(s) is debited and a revenue account is credited. If payment succeeds (or is anticipated to succeed) provision, a receivable is created, to be resolved as consideration is received.³

Method

Many accounting decisions hinge upon chosen methods of measurement and recognition of given items. Should an entity recognize its significant holdings using the consolidation method or the equity method? Will it age its receivables or use the income statement approach? What qualifies as significant or material? These choices provide a kind of overlay on outside perceptions of events and states within a company. While

² ASC 605-10-S99

³ ASC 310-10-30

accounting methods may have no direct influence on past events, choices of method affect future behavior by forces inside and outside the company. Inventory valuation is a classic example. In times of rising prices, LIFO (last in, first out) valuation will result in higher cost of goods sold numbers and lower inventory values, FIFO (first in, first out) will result in the opposite, and average costing values will fall somewhere in between the two extremes. Any type of inventory valuation can be constituted, given adequate data and computing power, but a difference in methods will likely result in altered income figures, associated taxes, and balance sheet valuation.

Valuation

Issues related to valuation are ubiquitous within accounting standards. Ideally, accounting standards should prescribe at least one method to ascribe a value to any transaction or object, however uncertain. For the purposes of this paper, the US dollar will be the standard of valuation, independent of inflation indexing.

The method by which a firm values a given transaction or balance is often the product of management judgment, due to either inherent uncertainty or the simple fact that management is allowed discretion in choosing a method.

Certainty

Many events have not occurred at the point of their initial journalization (e.g. unearned revenue, bad debt expense, stock option expense) and ledger entry, and are instead expected to occur in the future. This anticipation leads to several obfuscations of true value. First, the certainty of occurrence is not perfect even under ideal conditions.

We cannot state with absolute certainty that our debtors will repay us, or that we will be able to repay our creditors. In a similar vein, the length of time between the booking of an anticipated future event and that event's occurrence may be separated by a considerable length of time. In this case, to properly value the transaction at the earliest prudent interval, present value calculations may need to be used. Should interest rates change, or should two counterparties use differing rates of return, the valuation of a given transaction will be inaccurate.

Recognition becomes especially crucial when measurement involves estimates, either due to a contingency on future events or a need to establish a fair value in the absence of an arm's-length counterparty. While many transactions and balances can be easily valued, many others involve some degree of uncertainty. A simple cash transaction, for instance, can be easily assigned a single, undisputable valuation. Accounts receivable are less certain, and estimates must be made regarding uncollectibility. Stock options, contingent liabilities, and warranty expenses are all examples of the need to estimate future benefits and obligations in the face of incomplete information. Standards related to stock option valuation have been especially variable.

The three-level method currently employed to find fair value is a telling example of variable certainty. Level One (optimal) input is the value of an identical asset traded in an active market. The fair value of one share of a stock traded on the London Stock Exchange, for instance, is the same as any other. In the absence of such identical Level Two valuation is based on market observables. These observables may come from

identical items traded in less-active markets, similar items being traded in active markets, or other sufficient market data. Level Three is least preferable, basing valuation on unobservable inputs. In the event that an asset has no reasonable analogues in any active market, and there is no other observable attribute of the asset that would assist in valuation, a reporting entity is allowed to use its own assumptions about the anticipated behavior of market participants regarding that asset.

While the particular merits of such a system are debatable, the structure of such valuation can be formalized with a set of variables. The presence of an analogue is a binary (Analogue); either one exists (1), or none exist (0). Whether that analogue is traded in an active market is another (ActiveMarket = 1, 0). The degree of similarity between analogues represents a scalar variable (similarity = $0 < x < 1$, for instance). A hypothetical Tier 2 asset might be listed as follows:

Asset(x)

Analogue(x) = 1

ActiveMarket(x) = 1

Similarity(x) = 4

Many other valuation efforts can be equally formalized into discrete variables.

Balances and transactions

The proposed ontologies in the accounting domain have tended to focus primarily (though not exclusively) upon either balances (e.g. XBRL) or transactions (e.g. REA). The former approach concentrates upon the generation of final figures for further analysis, as is the case with XBRL-tagged financial statements. These approaches take

transaction information as given, deriving balances from preexisting data. As the primary goal of financial accounting standards is to present balances in a statement format, it is not surprising that the format currently advocated by the SEC is heavily balance-oriented.

The latter tend to be more appropriate to database-oriented systems and needs. Transaction-oriented ontologies focus on individual events as the building blocks from which balances can later be derived and constructed. The Pacioli-developed double-entry bookkeeping method is an example of a transaction-oriented system, focusing first on individual events and subsequently developing balances. Entries are posted to a journal, representing individual, multi-element transactions. T-accounts are subsequently updated within the ledger, refreshing respective balances. While balances are naturally the products of their constituent transactions, both can be updated in tandem if a properly geared system is put in place.

An ontology meant to formalize the process of figure presentation will naturally require a balance focus.

XBRL-GL: A guiding example

XBRL-GL (hereafter “GL”) was developed to be implemented directly into the computer systems of a firm. It contains an ontology derived from XBRL and a vast number of attributes to describe the universe of accounting information. GL has already been successfully implemented in several real-world corporations⁴. Given that GL

⁴ The first such implementation, at Japanese textile manufacturer Wacoal, is detailed at <http://www.xbrl.org/Business/Companies/Breathing-New-Life-into-Old-Systems.pdf>

straddles the gap between XBRL-FR (the more well-known denomination of XBRL geared toward financial reporting) and real-world database management, it is an appropriate starting point for the development of formalized accounting standards. GL is geared toward internal use, and the language of GL is therefore positive – describing events and states as they occur, as opposed to normative – prescribing proper treatment for those events and states.

Operation

Table 2 contains a complete list of attributes of a single journal entry entered under GL⁵:

Date Posted	Posting Code	ID for Reversing, Standard or Master Entry
Entry Creator	Batch ID for Entry Group	Recurring Standard Description
Entry Last Modifier	Batch Description	Frequency Interval
Entry Date	Number of Entries	Frequency Unit
Responsible Person	Total Debits	Repetitions Remaining
Source Journal	Total Credits	Next Date Repeat
Journal Description	Type of Difference Between Book and Tax	Last Date Repeat
Type Identifier	Elimination Code	End Date of Repeating Entry
Entry Origin	Budget Scenario Period Start	Reverse
Entry Identifier	Budget Scenario Period End	Reversing Date
Entry Description	Scenario Description	Entry Number Counter
Entry Qualifier	Scenario Code	
Entry Qualifier Description	Budget Allocation Code	

Table 2: List of XBRL-GL journal entry attributes.

This list represents the effects of both pragmatic data entry and management concerns and a desire to accurately represent and manage transactions, both individually

⁵ gl.iphix.net/browser.htm

and in groups, on a reporting level. It is geared exclusively toward the inner workings of a firm in an effort to streamline the process of XBRL-FR statement generation. As this concept takes issue with the very presentation of current financial statements, XBRL-GL will be useful as one of many guiding examples, and not the keystone of this new system.

Application to lease accounting

My chosen focus for this paper is lease accounting, a small but complex segment of the accounting standards landscape. Lease accounting is particularly topical at this time due to coming changes in FASB accounting rules.

Historical lease accounting standards

ARB 38

Released in October 1949, Accounting Research Bulletin No. 38 is a 3-page document that applies a rather broad set of disclosure principles to both conventional leases and sale-leasebacks. Essentially, the standard states that a company must disclose the following for all material leases:

1. Annual rent amounts, along with “some indication of the periods for which they are payable;”
2. “Any other important obligation assumed or guarantee made in connection therewith;”
3. During the year of lease inception, “there should be disclosure of the principal details of any important sale-and-lease [sale-leaseback] transaction.”

The ARB further states that this information should be provided for every year for which the amounts disclosed are material. Paragraph 6 of ARB 38 distinguishes between operating and financing leases using several criteria:

1. The presence of a bargain purchase option.
2. The stipulation that rental payments may be applied toward a future purchase.
3. Rental payments are sufficiently dissimilar from those other similar properties that such payments cannot be said to be for current use, instead creating the presumption that a long-term purchase plan is in place.

When any of these conditions are met, the transaction is in substance a purchase, and the lessee shall include the leased property among its assets, with corresponding liabilities and charges to the income statement.

APBs 5 and 7

APBs 5 and 7 were issued in September 1964 and May 1966, respectively, to deal with the increased use of leases and their simultaneously decreasing disclosure uniformity. The new standards were issued in response to the AICPA's *Accounting Research Study 4, "Reporting of Leases in Financial Statements,"* which involved a deep discussion of the nature of property rights. If it is true that entities should report the rights and obligations held in relation to leases, then the question of what leases or parts of leases give rise to property rights must be addressed. While the Accounting Principles Board believed that such rights and obligations did merit distinct reporting on the balance sheet and income statement, it disagreed with the AICPA's use of property rights as the

main distinction between lease types. APB 5 asserted that “the distinction depends on the issue of whether or not the lease is in substance a purchase of the property.”⁶ Non-purchase leases, however, still convey some contractual right of use asset, and were considered a type of executory contract. This Opinion addresses “the question of whether assets and liabilities should be recorded in connection with leases of this type,” which is itself “part of the larger issue of whether the rights and obligations that exist under executory contracts in general...give rise to assets and liabilities which should be recorded.”⁷ The conclusion of APB 5 is that executory contracts do *not* give rise to assets and liabilities, and should therefore be simply disclosed in the notes to the financial statements. This distinction between outright ownership and right of use is a forebear of the later dichotomy between capital and operating leases, a distinction which has carried through to the present day. APB 5 includes several criteria by which an in substance purchase may be identified.

1. The initial term of the lease is materially less than the asset’s useful life and the lessee has the option to renew at substantially less than the fair rental value.
2. The lessee has the right, during or at the end of the lease, to acquire the asset at less than its probable fair value at the time of acquisition.
3. The property was acquired by the lessor to meet the special needs of the lessee and will probably not be useful for any other purpose.
4. The term of the lease substantially corresponds to the estimated useful life of the property, and the lessee is obligated to pay the costs normally associated with ownership (e.g. taxes, insurance, maintenance, etc.)

⁶ APB 5 Paragraph 5

⁷ APB 5 Paragraph 7

5. The lessee has guaranteed the obligations of the lessor with respect to the leased asset.
6. For tax purposes, the lessee treats the lease as a purchase.

Current lease accounting standards: ASC 840 (FAS 13)

Under current lease accounting standards, initially promulgated as FAS 13 and later reclassified under the Accounting Standards Codification as ASC 840, leases are accounted for as either *operating* or *capital*, depending on the structure of the lease. An asset held under an operating lease remains on the lessor's balance sheet, and the lessee's payments to the lessor are expensed as incurred. An asset held under a capital lease is treated as an item on the lessee's balance sheet, and depreciated as such. If any one of the following four thresholds is met, a lease is classified as capital; otherwise, it is classified as operating:

5. Ownership of the asset transfers to the lessee at termination of the lease.
6. The lease terms allow the lessee to purchase the asset from the lessor at a significantly reduced price.
7. The lease term is equal to or greater than 75% of the estimated economic life of the asset.
8. The present value of all lease payments represents at least 90% of the fair value of the asset.

Proposed lease accounting standards: Topic 840

Currently proposed lease accounting standards would do away with the capital/operating dichotomy, requiring lessees to recognize right-of-use assets and associated lease payment liabilities on the balance sheet. The lessee is obligated to measure the present value of lease payment liability at lease inception, recognizing a right-of-use asset equal to the value of that liability plus initial direct costs.

Information gathering

The available sources of information regarding lease standards and their implementation are described and analyzed in the previous chapter of this dissertation. Major concerns tend to revolve around the cost of monitoring multiple descriptive elements of individual leases and the lack of prescribed uniformity regarding lease analysis. My proposed ontology and formalization must address these issues.

Problem formalization

The questions that must be answered to adequately describe the current problem relate to the nature of leases themselves. What are the essential attributes of a lease, regardless of its accounting treatment?

A lease, whether capital or operating, or indeed along any ex post facto continuum, is similar to an ordinary long-term asset acquisition. There are several common attributes between the two. Like a long-term asset purchase, a lease involves the acquisition of a fixed asset for productive use, consideration is paid to the provider of the asset, and the asset's value will be allocated over a period roughly equivalent to its useful

life, expressed as the shorter of the period of actual usefulness or contractual length. (The obvious exception to the useful life value allocation is land, but this exception holds equally true for both acquisition modes.)

Historical cost vs. fair value

Historical cost and fair value represent two divergent methods of valuing the same transaction or object. The debate about which is more value-adding or informative is beyond the scope of this paper, and has been covered extensively in extant literature (Sterling and Radosevich 1969, Freeman 1978, Wier 2009, Barlev and Haddad, 2007). However, the choice of a given method will color the path from ERS to NRS, or from a given object or event to its representation on the financial statements.

The issue of choice between historical cost and fair value treatments of a given phenomenon derives from a compromise between accuracy and relevance. If a transaction has occurred in the past, the historical cost principle provides a clear path to a simple valuation. Under different instances of fair value accounting, that same event may be given different values at different points in time, possibly varying from statement period to statement period, as facts and circumstances surrounding the resulting assets change. The valuation dichotomy essentially focuses on the loci of value for a given transaction. Historical cost focuses on occurrence of past events, while fair value gives greater weight to future events which have varying degrees of likelihood of occurrence and/or impact upon a given asset. The *coefficient of certainty*, which I have developed here to address this concept, may be applied with equal efficacy to both valuation methodologies. The following figures illustrate the proper thought pattern for application

of this coefficient under differing conditions.

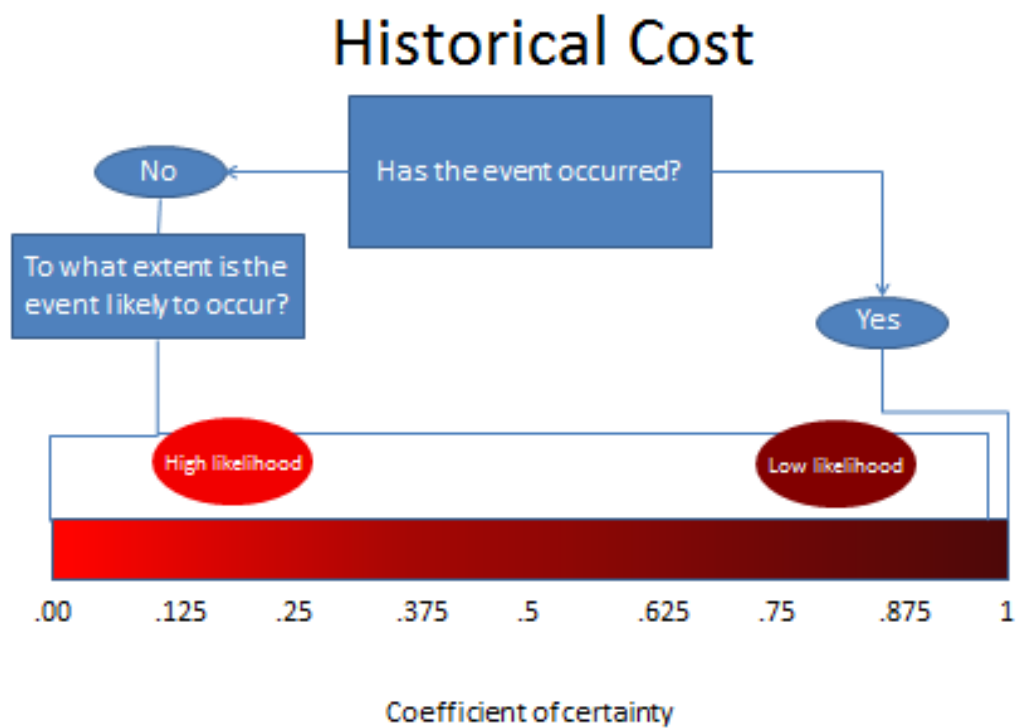


Figure 3: Certainty determination under a historical cost schema.

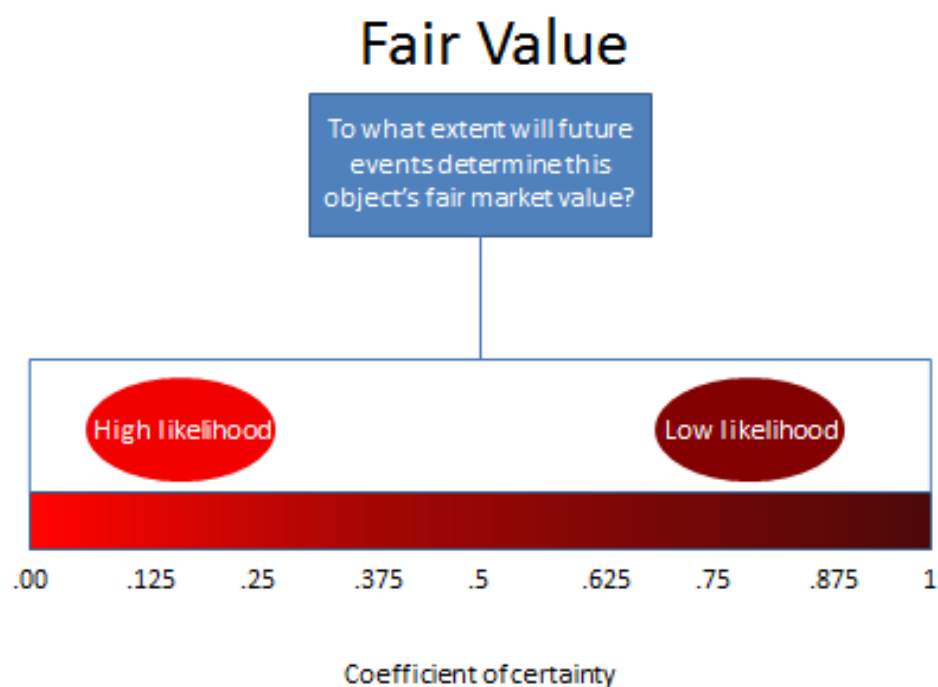


Figure 4: Certainty determination under a fair market value schema.

This concept can be applied to leased asset valuation as follows:

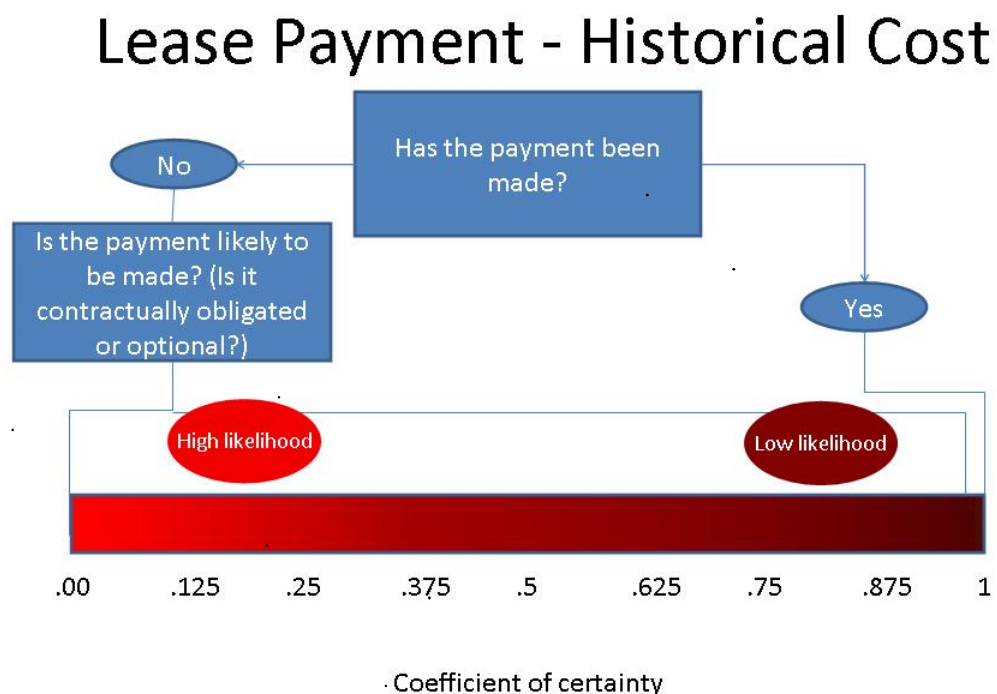


Figure 5: Application of certainty determination to lease payment valuation under a

historical cost schema.

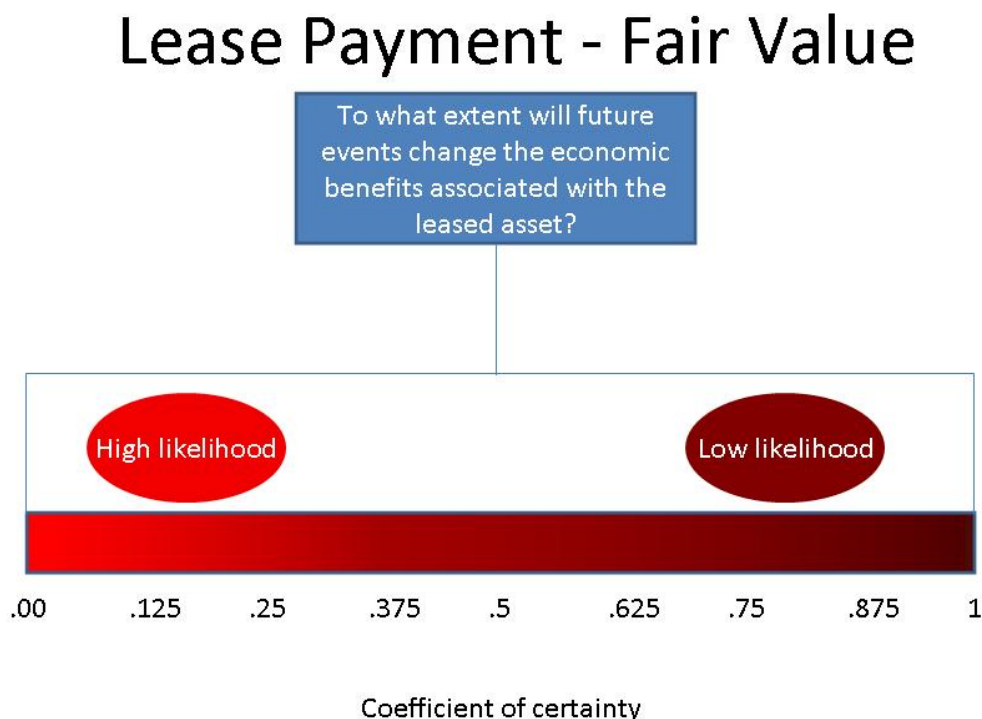


Figure 6: Application of certainty determination to lease payment valuation under a fair market value schema.

Liability value

The FASB has explained that the liability of an entity to make anticipated rent payments is the fundamental source of valuation for the related asset.⁸ How a firm anticipates future rent payments will directly determine its valuation of the related asset.

The treatment of rent payments by accounting standards language anticipates a degree of uncertainty. In some cases, minimum value payments over a minimum time period are all that must be anticipated, and these may require simple present value calculations in lieu of complex judgment. However, several complicating elements may

⁸ ASC 840-30-30-1

exist and cause a departure from easy calculation. Many contracts do not involve a single, fixed term with fixed payment values. Naturally, some measure of discretion may be required to properly value rent payments that incorporate future changes, whether certain or possible.⁹ Payments can escalate over time, so that the annual rent in a contract's tenth year is higher than in its first year, reflecting increases in property values, real estate taxes, inflation, etc. Rent payments can also be contingent upon production (e.g. the more units produced by a leased machine, the higher the associated rent expense). There may also be an extension option. A ten year lease may include a clause for an optional five year extension at an increased annual rent expense. Payments may also include a mid- or end-of-term purchase option, possibly differing from the market purchase price for the leased item.

By definition, a lease will require future payments from lessee to lessor, with values determined with some level of certainty. We may also be able to scale elements along a continuum of certainty. A company reporting minimum rent payments over the minimum contractually specified term can be said to have high certainty, even if it is likely that the term will be extended and/or more capital will eventually be paid to the lessor. A more detailed figure involving most-likely values of rent payments, possibly incorporating term extensions or escalated payments, may require lower certainty thresholds in order to be reported.

⁹ ASC 840-30-30-2

Other costs and liabilities

Some of the distinctions between leased and owned assets relate to the placement of responsibility for different eventual costs. Maintenance is a common example. If a company owns outright a building it uses, it will naturally be responsible for that building's maintenance. The company will either expense maintenance costs as incurred or preemptively anticipate and expense those costs beforehand. If that same building is instead leased from a landlord, many different potential arrangements exist. The lessee may be required to pay for maintenance as needed. The lessor may fulfill that function without any payment from the lessee. A third common arrangement is for the lessee to pay security deposits to the lessor, to be reimbursed when maintenance costs are incurred by the lessee. Should the amount of deposits be greater than the amount of actual maintenance expenses incurred, contracts can be structured wherein the lessor either remits or retains that excess amount.¹⁰ In this example, leases add complexity to the *nature* of eventual payments, but not to their existence.

Asset value

Cash inflows

A leased asset, like an owned asset, is held for productive use and should be a source of value flowing into a company. Different assets generate cash flows in different ways; inventory, for instance, is sold directly, while prepaid rent follows a more circuitous path between performance of function and cash inflow.

The valuation of assets can be broadly categorized into two groups. One,

¹⁰ ASC 840-10-05-9A-C

including PPE and inventory, is normally valued at historical acquisition cost under current US GAAP.¹¹ The other, including investments, is held at fair value. An asset is valued either at the resources given up to acquire it, giving priority to expenses and liabilities, or at the resources a counterparty would trade to acquire the asset currently, giving priority to the productive capacity of the asset itself.

As with the valuation of a liability, any non-cash asset valuation involves varying degrees of complexity. With the exception of historical cost accounting for past events, all involve estimates of future value and activity and therefore some degree of certainty. As all historical lease accounting standards deal with leases from a liability perspective, I will follow suit and prioritize lease liability when discussing leased asset valuation.

Solution formalization

Description of ontology

An appropriate lease ontology will include such items as are necessary to describe it to users. In the case of lease accounting, these descriptors will be heavily focused on future payments. This will hold true regardless of the nature of prevailing accounting standards; historical, current, and proposed lease accounting standards require detailed information on the nature of future obligations to perform proper valuation.

There must be a distinction made between fundamental, real¹² objects and the

¹¹ This is true except in cases of impairment or lower-of-cost-or-market issues.

¹² The term “real,” in this context, does not necessarily refer to assets with physical existence. Rather it refers to benefit-generating assets themselves, be they real or intangible, and not the arrangement of possession that accompanies them.

rights attached to those objects through contracts, agreements, arrangements, etc. A single piece of equipment may be held for productive use under nearly infinite ownership, rental, leasing, or exchange arrangements. Proper financial statements ought to convey both the productive capacity of a given asset and its ownership structure.

Objects

Assets are defined by the FASB as sources of probable future benefit. Assets held under a capital lease are no exception to this rule. The current FASB definition of a capital lease is as “an asset and an obligation”¹³ to the lessee. The dollar value attached to the obligation is derived (via either numerical determination or estimation) first, as the present value of all non-executory minimum lease payments. The value of the rent liability is determined first, with the value of the asset set equal to that amount. The determination of the lease term and value of each lease payment, whether certain or estimated, are the first step in valuation of a capital lease regardless of the methods used in later steps.

Attributes

Value

Accounting is primarily focused on the representation of the flows and balances of dollar values. As a lease is characterized by a series of regular (though not necessarily equal) payments in exchange for the use of a long-lived asset, the value being exchanged can be established as the value of the underlying asset. This concept is applied via

¹³ ASC 840-30-25-1

different methods to both the current definition of capital leases¹⁴ and the proposed definition of right-of-use leases. While operating leases are financed off-balance sheet, the disclosures required for operating lessees essentially require the transmission of the same information.¹⁵ The essential differences between current and proposed standards have more to do with *which* payments will be included in the calculations from which a single present value is derived.

By definition, all leases involve a certain set of regular payments; however, this single set is by no means comprehensive of the entirety of potential lease payments.

Other common features of leases are:

- Initial costs. These include commissions, legal fees, closing costs, and any other costs directly related to securing and negotiating a lease. These costs may be considered an incremental addition to the value of the lease.
- Extensions. A lease contract may include an option for the lessee to extend the term of the lease for a certain number of additional, discrete intervals (e.g. a 5-year lease with 3 optional 1-year extensions). The existence of these extensions, along with their likelihood of exercise, may impact the valuation of the lease.
- Abatements. Lessors will occasionally offer abatements, or rent-free periods, as an enticement to potential lessees for satisfying certain conditions (e.g. 1 free year if the lessee agrees to a 10-year contract instead of a 5-year contract). This difference can be treated in a variety of

¹⁴ ASC 840-30-30-1

¹⁵ ASC 840-20-50-2.

ways (e.g. recognition at lease inception, recognition at lease termination, amortization over the lease term, etc.).

- **Improvement allowances.** The lessor may provide a certain amount of funds to be used toward the improvement of the asset toward the lessee's desired use. The existence of an improvement allowance represents an interesting contradiction in treatment. From one perspective, improvement allowances can represent a reduction in lease liability, especially if any unused portion of the allowance is refunded to the lessee. On the other hand, improvement allowances can be used to increase the productive capacity of the leased asset. The existence of this allowance must be adequately described in this ontology, even though it is not addressed in any form in current lease accounting standards. The type of allowance must be classified based on the fate of unused funds. If any unexercised portion of the allowance is refunded to the lessee, we can assume a net increase in owner equity equal to the full value of the allowance, with that credit counterbalanced by either an increase in initially recognized asset value or a reduction in rent liability. If not, then only the asset value increase may be anticipated.
- **Service components.** The lessee may lack the capacity to maintain, operate, and/or service the leased asset alone. Concurrent with the transfer of the productive capacity of the asset, many leases also include service contracts (e.g. a license to obtain technical support included with the lease of a web server, or a contract to receive regular maintenance on leased oil

derricks). This type of component and its treatment under proposed lease accounting standards has been a source of great contention (c.f. the previous chapter of this dissertation).

- Purchase option. The inclusion of a purchase option at or before lease termination may considerably change the lease's profile. Proposed lease accounting standards require that purchase options be anticipated and accounted for separately from lease valuation, while current standards

In an effort to simplify and formalize the accounting for lease payments, and in light of the fact that all of the above types of transactions represent fundamental exchanges of items of value, I propose that each such payment from the lessee's perspective possess the following attributes:

- Future value. This dollar value represents the amount expected to be paid or received¹⁶ at the point or points in the future when that amount is either required or else most likely to be paid.
- Present value. Using the lessor's, lessee's, or some other rationally chosen discount rate, the future value of any payment can be quickly and usefully discounted to the present moment with a minimum of computational difficulty.

Term

Closely related to a lease's valuation is its duration. Lease duration can be seen as a series of regular payment dates. Calculation of term is simply a sum of these payment

¹⁶ Note that those payments that reduce liability, such as abatements and allowances, are treated similarly to ordinary, liability-increasing payments. They are simply assigned a negative value.

periods. This necessitates the creation of the following attributes:

- Number of payments. Whether historical or anticipated, we can discuss the number of payments delineated under a given contract.
 - Payment interval. Examples include monthly, annual, weekly, etc.
- From these two descriptors, lease term (or any other desired term) can be easily and automatically calculated.

Continuum of certainty

The above-discussed elements carry varying degrees of likelihood of occurrence. I propose to formalize the concept of certainty as a numerical continuum ranging from 0.00 to 1.00, represents the likelihood of occurrence of any given event. Events that have occurred in the past possess a certainty of 1.00; future events are rated from 0.00 – 0.99. In the latter case, judgment, professional expertise, inside knowledge, and industry experience may become determining factors. Consider the example of rent extensions. If a lessee has a longstanding relationship with a given lessor, is in a market with a negligible chance of material contraction, and has no plans to shift its operations, then extension terms regarding that lessee's leases may bear considerable weight (e.g. 0.90). If a different lessee deals in a more volatile market, has not enjoyed a long relationship with its lessor, or otherwise does not normally deal in long term lessor-lessee relationships, then the certainty of exercise of a lease extension may be reduced (e.g. 0.35).

The chief benefit to be realized from this continuum is the operationalization of erstwhile vague and ambiguous accounting standards terminology. Terms like “remote,” “reasonably possible,” “virtually certain,” and “probable” have received little or no

formal definition within current accounting standards.

Implementation - sample lease

At this point, real lease data must be used in order to test the concept of lease formalization. I have acquired a redacted lease abstract from an S&P 500 firm, presented in full as Appendix E, detailing an individual building lease.¹⁷ The following tables describe the economic facts of the lease.

Term: 11 years

Renewal term: 5 years

Number of renewal options: 2

¹⁷ For timing purposes, we assume that the figures generated for the remainder of this discussion are geared toward a January 1, 2012 financial statement issuance date.

Start Date	End Date	Monthly Payment	Rent/ sq. ft.	Annual rate %
2/6/2012	2/28/2014	\$43,177.31	\$16.75	
3/1/2014	2/28/2015	\$44,053.75	\$17.09	2%
3/1/2015	2/29/2016	\$44,930.18	\$17.43	2%
3/1/2016	2/28/2017	\$45,832.40	\$17.78	2%
3/1/2017	2/28/2018	\$46,734.61	\$18.13	2%
3/1/2018	2/28/2019	\$47,662.60	\$18.49	2%
3/1/2019	2/29/2020	\$48,616.37	\$18.86	2%
3/1/2020	2/28/2021	\$49,595.91	\$19.24	2%
3/1/2021	2/28/2022	\$50,601.23	\$19.63	2%
3/1/2022	2/28/2023	\$51,606.56	\$20.02	2%
3/1/2023	2/29/2024	\$52,638.69	\$20.42	2%
3/1/2024	2/28/2025	\$53,691.47	\$20.83	2%
3/1/2025	2/28/2026	\$54,765.29	\$21.25	2%
3/1/2026	2/28/2027	\$55,860.60	\$21.67	2%
3/1/2027	2/29/2028	\$56,977.81	\$22.10	2%
3/1/2028	2/28/2029	\$58,117.37	\$22.55	2%
3/1/2029	2/28/2030	\$59,279.72	\$23.00	2%
3/1/2030	2/28/2031	\$60,465.31	\$23.46	2%
3/1/2031	2/29/2032	\$61,674.62	\$23.93	2%
3/1/2032	2/28/2033	\$62,908.11	\$24.40	2%

Table 3: Sample lease rent payment schedule.

Valuation

Payments

As with many arrangements, this lease includes various payments with different levels of certainty of occurrence. The original term of the contract is 11 years, with termination permitted at the end of the fifth lease year. Two 5-year extension options exist, extending the potential length of this term to 21 years.

Each lease payment can be analyzed as an independent item. Each payment has a number of formalizable attributes:

- Future value.
- Discounted present value.

- Date of payment.
- Certainty of payment.

For example, the very first payment is due on February 6, 2012. Its future value is 43,177.31. Discounted at the implicit rate of 2% annually (or .16667% monthly), the present value of this payment on January 1, 2012 is 43,105.47. Given the extremely short latency between the time of statement issuance and the time of payment and the unambiguous nature of the lease agreement, we can presume a very high level of certainty, both of the occurrence of the payment and of its value.

Date	2/6/2012
Payments	1
Interval	Monthly
FV	43,177.31
PV ¹⁸	43,105.47
Certainty	0.99

Table 4: First monthly payment attributes.

Similar assumptions can be used to value the remainder of the first year's payments.

Start date	2/6/2012
End date	2/28/2013
Payments	13
Interval	Monthly
FV	561,305.03
PV	545,255.63
Certainty	0.99

Table 5: First year's payment attributes

Going further, a table can be generated to value the entirety of the initial eleven-year contractual length of the lease:

¹⁸ We assume a 2% annual rate, as discussed in the contract, divided over twelve months.

	2/6/2012	3/1/2013	3/1/2014	3/1/2015	3/1/2016	3/1/2017
End date	2/28/2013	2/28/2014	2/28/2015	2/29/2016	2/28/2017	2/28/2018
Payments	13	12	12	12	12	12
Interval	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
FV	561,305.03	518,127.72	528,645.00	539,162.16	549,988.80	560,815.32
PV	545,255.63	513,412.32	513,412.32	513,412.32	513,412.32	513,412.32
Certainty	0.99	0.99	0.99	0.99	0.99	0.99
	3/1/2018	3/1/2019	3/1/2020	3/1/2021	3/1/2022	
End date	2/28/2019	2/29/2020	2/28/2021	2/28/2022	2/28/2023	
Payments	12	12	12	12	12	
Interval	Monthly	Monthly	Monthly	Monthly	Monthly	
FV	571,951.20	583,396.44	595,150.92	607,214.76	619,278.72	
PV	513,412.32	513,412.32	513,412.32	513,412.32	513,412.32	
Certainty	0.99	0.99	0.99	0.99	0.99	

Table 6: 11-year lease attributes.

These payments exhibit regularity, direct calculation, and predictability, making for simple formalization. The addition of uncertainty will lead to multiple potential representations, and the ontology I have developed will address these uncertainties.

Term extensions

The presence of two potential but not obligatory term extensions creates a degree of uncertainty in valuation. The likelihood of the lessee exercising these options is almost certainly a function of professional judgment, coupled with industry and firm-specific knowledge. In the absence of such knowledge, let us hypothetically assume that the first term extension of this lease has a 75% likelihood of being exercised, while the second has a 50% likelihood. The payments still *exist* in the same manner as the contractually obligated payments above, but with a lower degree of certainty.

Date	3/1/2023
Payments	1
Interval	Monthly
FV	52,638.69
PV	43,105.47
Certainty	0.75

Table 7: Optional lease payment attributes.

Abatements

This lease includes an abatement of rent for the period 2/6/12-12/31/12. Current practice at this company is to divide and amortize the benefit evenly over the life of the lease. Since abatements are not directly addressed in current or proposed lessee accounting standards, there is no way to be certain that this is an acceptable or intended abatement treatment. An abatement can be considered to be a “negative payment;” that is, it cancels out a set of scheduled, positive rent payments. To provide easier manipulation, we can treat it as such. The following details a single abated rent payment.

Date	2/6/2012
Payments	1
Interval	Monthly
FV	(43,177.31)
PV	(43,105.47)
Certainty	0.99

Table 8: Single abated rent payment attributes.

Expansion of this concept to the entire set of abatements yields the following:

Start date	2/6/2012
End date	12/31/2012
Payments	11
Interval	Monthly
FV	(474,950.41)
PV	(470,663.90)
Certainty	0.99

Table 9: Full rent abatement attributes.

Given this set of values, a host of possible manipulations can now be formalized. As the abatement occurs at the beginning of the lease, the liability can simply be reduced by the total value of the abatement at lease inception, with regular rent payments beginning to reduce the remainder of the liability only when such payments are actually made. Abatements can also be amortized over the life of the lease, defined as either the minimum contractually specified term, the most likely term, or the longest potential term given the exercise of all optional extensions. For the sake of conservatism, the firm may be required to delay recognition until the tail end of the lease term.

Maintenance

As detailed in the lease document, all repairs and maintenance will be handled at the sole expense of the lessor, and will therefore not be included in the lessee's lease valuation.

Initial costs

The costs incurred by a lessee may include such items as commissions, legal fees, rent deposits, etc. While the dollar value of these costs is not detailed in the lease document I have acquired, initial costs are assumed to have been incurred and are expected to be paid by the lessee over the life of the term.¹⁹ As the purpose of this exercise is as a generalizable demonstration, and not a perfectly accurate reflection of a single, specific loan, let us assume that these costs total \$1,000,000 and will be amortized annually over the contractually obligated term of the loan.

¹⁹ Transaction costs (improvement allowance plus commission) are discussed on page 3 of the lease document, included here as Appendix E.

Start date	2/6/2012
End date	2/28/2023
Payments	11
Interval	Annual
FV	1,000,000.00
PV	907,508.18
Certainty	0.99

Table 10: Initial cost attributes.

Improvement allowances

This lease contract provides an improvement allowance equal to \$50 per rented square foot, totaling \$1,546,650 for 30,933 square feet. Should these funds exceed the lessee's improvement requirements, the remainder will be allocated either against any work which the lessee has contracted to perform for the lessor, or as a credit against base rent. The anticipated use of these funds is currently unavailable, but we may conjecture about a set of possibilities. It is possible that this amount of improvement allowance will be fully utilized, with no remainder left to offset other amounts. It is also possible that some, but not all, of the allowance will be utilized, with the remainder being used to fund lessee-assigned work or to offset future rent payments. While remote, there is also a possibility that none of the improvement allowance will be utilized and all of it will go toward cost offsetting.

Since the contract specifies that the full \$1,546,650 will be received by the lessee *in some form*, either as an improvement of the leased asset or as a reduction in a related liability, the issue here is one of fundamental valuation. The former is demonstrably income as an asset improvement; the latter is likewise income as a reduction of liability. If standards dictate that a leased asset is to be valued at the present value of lease

payment liability, then the value of the potential offset is of great importance. If the asset is to be valued instead at the present value of its potential for future use, then the amount expected to be put toward improvement (and not used as an offset) becomes the critical issue.

Let us assume that 75% of the improvement allowance is expected to be used over the first two years of the lease, spent evenly throughout that period, with the remainder going to offset rent payment liability beginning at the start of the third year. Let us further assume that these amounts are deemed to be reasonably though not completely certain (coefficient: .80). The former amount will have no numerical effect on the inherent rent payment liability, and as I am assuming a liability-centered valuation, it can be ignored in the arithmetic and instead be disclosed in a separate schedule in the notes to the financial statements. The reduction of liability can be presented as follows:

Start date	1/1/2014
End date	9/1/2014
Payments	8.78 ²⁰
Interval	Monthly
FV	(386,662.50)
PV	(379,081.86)
Certainty	0.80

Table 11: Improvement allowance attributes.

Evaluation: Potential representations

The variables presented here can be manipulated in a variety of ways based on prevailing standards written in a manner that directly addresses the underlying attributes

²⁰ $(1,546,650 * 25\% = \$386,662.50$. Monthly rent payments in 2014 will be $\$44,053.75$. $386,662.50 / 44,053.75 = 8.78$ rounded to two decimal places.

of relevant objects. The valuation of this lease can be one of a host of different figures or ranges, depending on certainty thresholds. For instance, if “virtually certain” is defined to mean only those future events with a greater than 98% likelihood of occurrence, then the present value of this lease obligation will be equal to the present value of lease payments within the contractually specified 11-year initial period.

The ability of accounting standards to set priorities regarding certainty and conservatism is now a function of numerical manipulation. Conservatism can be “dialed in” with ease. Preparers can compile several sets of statements including items at different levels of certainty.

The flexible nature of this paradigm precludes a discussion of all possible financial statement presentations. What follow are several representative presentations based on manipulations of certainty coefficient thresholds. For the purposes of all items below, I will weight proportionally the certainty coefficient of each line item by its absolute value proportional to the sum of the absolute values of all reported lease elements.

Conservative presentation

Let us set the threshold for inclusion and presentation in the financial statements at .98 certainty. Only those events that have occurred or are virtually certain to occur will be presented. The elements of this lease valuation will be as follows:

Element	Value	Certainty
PV of all contractually obligated lease payments	\$5,224,454.51	.99
PV of abatements	(470,663.90)	.99
PV of initial costs	907,508.18	.99

Table 12: Elements of conservative lease valuation.

The final valuation of this lease will therefore be:

Value	\$5,661,298.79
Certainty	0.99

Table 13: Conservative lease valuation.

Full-disclosure presentation

To increase numerical disclosure at the expense of reduced conservatism and certainty, let us set the threshold for inclusion and presentation at .5, indicating that all events with a greater-than-even likelihood of occurrence will be included.

Element	Value	Certainty
PV of all contractually obligated lease payments	\$5,224,454.51	.99
PV of all optional lease term extensions	\$5,181,277.20	.63
PV of abatements	(470,663.90)	.99
PV of initial costs	907,508.18	.99
PV of improvement allowance	(379,081.86)	.80

Table 14: Elements of full-disclosure lease valuation.

The final valuation of this lease will therefore be:

Value	\$10,463,494.13
Certainty	0.83

Table 15: Full-disclosure lease valuation.

Balanced presentation

To strike a numerical balance between the two, let us instead set the threshold for inclusion and presentation at .75.

Element	Value	Certainty
PV of all contractually obligated lease payments	\$5,224,454.51	.99
PV of optional lease term extensions	\$2,590,638.60	.75
PV of abatements	(470,663.90)	.99
PV of initial costs	907,508.18	.99
PV of improvement allowance	(379,081.86)	.80

Table 16: Elements of balanced lease valuation.

The final valuation of this lease will therefore be:

Value	\$9,572,347.05
Certainty	0.92

Table 17: Balanced lease valuation.

Discussion

The essential benefit of the concepts demonstrated here is a transfer of power. No longer will the statement preparer have final say over the appearance of financial statements. Given a proper (and likely simple) computing system, an investor can now choose his or her own level of conservatism. The savvy investor can now run sensitivity analyses given company-sourced data.

An additional benefit is an implicit description of a company's assessment of risk. If the majority of a company's financial positions, particularly income-increasing positions, are held at a low degree of certainty, the company can be said to exhibit high conservatism. Peer- and prior period-comparisons can now include an added dimension of relative risk tolerance and assessment. The ramifications of such a degree of analysis are beyond the scope of this paper, but they should prove quite useful and interesting to investors and researchers alike.

Conclusion

The changing nature of accounting standards

The distinction between an event and its representation in the accounting domain is fundamental to accrual basis accounting. Accounting standards are a mechanism by which events are related and described to internal and external parties. They are a lens that refracts and reshapes the representation of events. In theory, with the advent of data-centered, electronically-transmitted, more granular accounting disclosures, standards become one of many such lenses. When a user can effectively overlay any open or proprietary set of rules and transformations onto a set of data representing unchanging past events, a set of standards that forces a particular perspective of potentially limited use to a given user become more hindrance than help. If IFRS prohibits LIFO, a properly savvy and equipped investor can simply reconstitute a company's LIFO inventory value given proper data. Capital leases can be re-classified as operating, and vice versa. Different valuation models can be applied to stock options. Limited standards no longer limit statement users. The focus of standards must therefore shift from a "one-size-fits-all" paradigm to a universally re-applicable conceptualization. Computers can disseminate, accept, and parse far more information than a human being, and standard setters must acknowledge this enhanced capacity by empowering individual users to make more decisions concerning implementation and interpretation of standards.

Limitations and directions for future research

The greatest limitation of this paradigm may be its capacity for perceived

oversimplification. Complex transactions may not be fully articulated under this paradigm, and I therefore strongly advocate in favor of traditional textual disclosures in addition to formalized, numerically-based presentations. While a prose-only promulgation scheme may leave automated systems under-standardized, a dearth of expansion upon key concepts may create an environment of either blind trust or suspicion in, rather than understanding of, the black box.

In addition, the concept of materiality remains elusive. In a future paper, I hope to address the additional formalization of a materiality concept. The difficulty inherent in materiality judgments is the requisite effort on the part of management in determining materiality. If a firm judges an item to be material at a certain size threshold (e.g. 2% of operating revenues), but an investor would consider items material at a lower threshold (e.g. 1% of operating revenues), is the firm obligated to provide further and more granular information? That which is not monitored cannot be reported upon. This inherent agency conflict will be difficult to address, and may in fact increase complexity rather than reducing it.

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5. Conclusion

The goal of this dissertation was to provide and justify a vision of a future in which accounting standards are simplified, coherent, and more readily adaptable to modern accounting systems. These papers have served to lay the conceptual and practical foundations for standards formalization.

Chapter 2 illustrates a high-level concept of current standards generation and implementation practices, replete with time- and effort-consuming clarifications and recompositions. Through multiple illustrations, I demonstrate the need for and potential application of pseudocode to accounting standards. Benefits illustrated include simplification, explicit calls to judgment, and easy application to a computerized environment. If this concept is implemented, it may lead to more efficient and uniformly applied accounting standards, improving comparability, consistency, and usefulness of financial statements created using these concepts.

However, Chapter 2 makes several assumptions regarding the nature of standards, judgment, and formalization that remain untested and unproven. While the principle of a simple judgment/automation dichotomy seems reasonable and able to be implemented, a complete analysis of all standards will be necessary for confirmation of the concept. This chapter also depends heavily upon the creation and maintenance of an ontology for all attributes of the body of accounting literature, a concept which will require broader consideration in future work.

In Chapter 3, a case is made for the benefits of formalization through the demonstration of its alternative's pitfalls. In the absence of the rigidity of formalization, and when moving from a bright-line system to a more ambiguous, principles-based and

judgment-dependent set of standards, significant costs are incurred both before and (if firms' own anticipations are correct) after implementation. These costs relate mainly to the need to satisfy vague requirements, to continually re-apply judgment instead of automation, and to expand accounting systems in an effort to account for previously unmonitored variables.

Formalization would improve this situation in several respects. By providing clear demarcations as to where and how judgment would be applied, a measure of unintended ambiguity would be reduced. This clarity will reduce litigation costs by specifying a clear set of requirements which must be adhered to. Additionally, it will promote comparability by encouraging more uniform intra-firm practices vis a vis implementation and monitoring. By creating a single set of monitored variables, formalization would reduce the costs associated with capacity expansion. If a firm can have confidence that it is monitoring every variable of potential relevance within the domain of accounting standards, then the only impetus for expansion of those systems will be an expansion of the business, and not a change in rules.

While this chapter demonstrates the foci of firms during and after the implementation process, several questions are left unanswered. Do concerns about cost diminish if a standard shifts from principles to rules? How do these concerns relate to post-implementation restatements? Can these concerns about judgment relate to earnings quality? Do other stakeholders (investors, audit firms, etc.) share these concerns, and if not, what concerns do they have? Future research will hopefully address these research questions.

In addition, this study was limited by small sample size in the case of the pre-

implementation study, and selection bias in the case of the post-implementation study. More to the point, the study did not directly test the benefits of formalization, instead only demonstrating the problems faced in its absence. While this perspective is illuminating, it is not comprehensive. In future work, I hope to run a study comparing firms with implementation methods featuring different levels of standardization and formalization to assess the benefits and weaknesses that accompany such a practice.

Chapter 4 involves the research, development, and application of formalization – and a related ontology – to lease accounting, a narrow, specific area of accounting disclosure and analysis. This chapter demonstrates the practical elements that must be considered when developing a new standard that must be applicable to a wide variety of user interests.

This ontology represents a re-conceptualization of the nature of financial reporting, and is accompanied by dramatic simplification of the elements of the lease accounting standard. Payments are payments, and they are separated not by any technical, lexical difference, but rather by their certainty of payment and the length of time before the payment is expected. Materiality is therefore a function of certainty and relative size.

From a macro level, one untested negative consequence of the formalization concept is the “check-the-box” compliance mentality noted by Schipper (2003). If formalization extends into the area that is currently the province of judgment, companies may seek to disclose at a minimally acceptable level, structuring arrangements and transactions to very neatly miss given formal thresholds. The generation of formalized standards must take this concern into account and anticipate, provide for, and maintain the use of professional judgment as a capstone in the application of accounting standards

where appropriate. The certainty coefficient is a prime example of amelioration of this issue; it is a way to quantify judgment without removing judgment. The application of standards to computers is not meant to turn accountants into machines, but rather to free them to focus on the critical, judgment-oriented tasks which computers cannot reliably accomplish.

A note on judgment

Discussions regarding prior versions of this dissertation have focused on the distinction between rules-based and principles-oriented accounting standards. We must repeat that this distinction is not one of principal importance to the formalization paradigm. Rather than demanding that a distinct choice be made between principles and rules, the concept of formalization serves to distinguish where judgment should and should not be applied. The third chapter of this dissertation notes that such a clear delineation should serve to improve the implementation process by reducing the need for redundant implementations and subsequent disagreements between auditors and firms, and among different industry firms.

Limitations and directions for future research

The primary limitations of this thesis are on its universal applicability. For better or worse, accounting standards *are* currently implemented by firms. A change in this process, especially one as dramatic as we are advocating, is necessarily laden with numerous as-yet unobserved potential difficulties. While we firmly believe that formalization will result in a net improvement in terms of clarity, simplicity, and uniformity of implementation, genuine verification can only accompany a real-world

instance.

A vision of the future

As we move into an era of increased data granularity, the concept of a statement as a whole becomes less and less applicable to the realities of modern reporting. In its place, the transmission of atomized, granular data will become the norm. Just as a net income figure is the result of a variety of additions (revenues, gains, tax benefits) and subtractions (expenses, losses), each constituent figure is itself a product of numerous subsidiary transactions.

Under a paper paradigm, the choice of accounting method inherently limits the end user's data processing ability to the extent that accounting methods create opacity between user and data. As we progress toward more granular data transmission, data manipulation becomes an easier, more readily executable task. Ratios can be more easily calculated, comparisons can be more easily drawn, and analysis becomes at once more rapid and more comprehensive. The advent of the internet and access to cheap, effective processing power have furthered these trends. At this point, however, we remain limited to analyzing data that has already passed through the filtration and mutation of accounting method choice. If Company A only provides LIFO inventory data and Company B provides only average cost data, comparisons between the two are inherently limited.

The next revolution will address this issue by allowing users access to raw data. If I can access Company A's entire inventory records, then their choice of LIFO valuation ceases to be relevant. I can choose to recompute their figures into average cost, FIFO, or any mixture of the three. Accounting methods are only relevant as a convenient sieve

through which to filter voluminous data into easily transmitted, easily understood numbers, regardless of their granularity or accuracy.

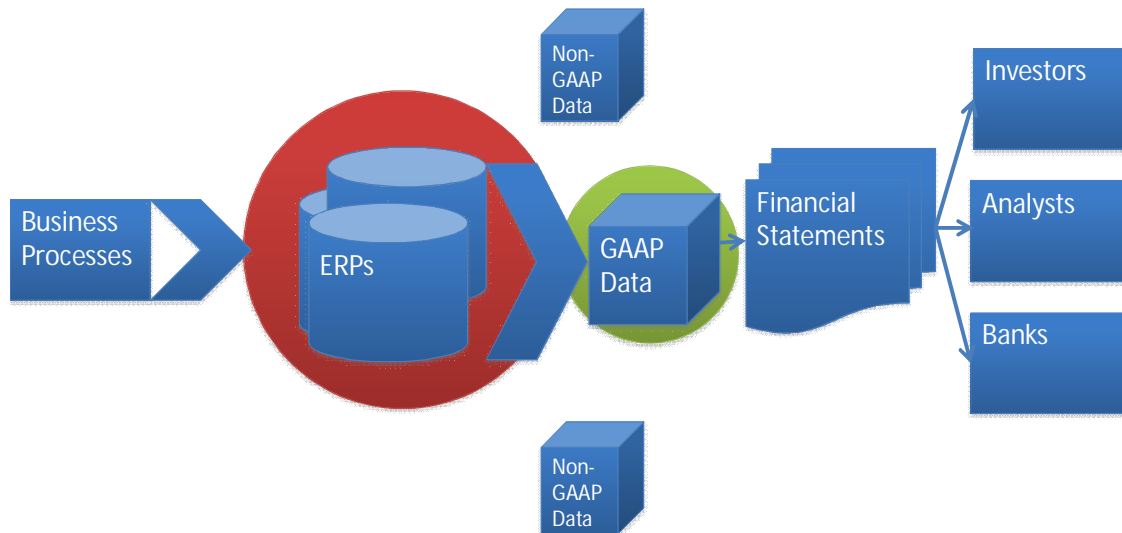


Figure 1: Reduction of ERP data to one set of GAAP-compliant disclosures.

Heretofore, businesses have been forced to choose one accounting method or another because they have been limited in their ability to transmit data. Providing paper documentation of highly granular transactions is a costly, time-consuming process with little benefit to end users. The human's processing power is naturally limited, and a single figure (e.g. "sales revenue") is far easier to grasp than a ticker showing tens of thousands of figures. A company will perform its own aging of receivables because it is too costly to provide each user with a master list of receivables, especially when that user most likely lacks the time or inclination to perform the task herself. However, with the implementation of a universal standards ontology and the progressive adoption of data

parsing technologies (e.g. XBRL), the amount of human effort necessary to absorb voluminous data is dramatically reduced. What once might have taken weeks or months may now take only minutes or seconds of processing time. The accounting profession has yet to take full advantage of this phenomenon. Rather than accepting data granularity as the norm, standard setters continue to debate the proper presentation of minutiae like stock option valuation and goodwill impairment.

Under this paradigm, accounting standards will become one of many conceivable templates. Users who prefer to see GAAP-compliant statements may do so; users who wish to see cash-based income statements will also get their wish. In addition to manipulation of certainty coefficients, as was accomplished in Chapter 4, there exists the potential for manipulation and selection of different valuation schemes, time horizons, etc. Income statements based on geographic regions or branches of a company can be compiled. When raw data is transmitted without the manipulation of accounting standards, those standards become merely one in a plethora of potential overlays.

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Figure 2: Dissemination of all ERP data to interested parties.

As data transmission becomes cheap and easy, it will be harder and harder for firms and standard setters to justify the use of a single, arbitrary “lens” (GAAP) for financial reporting.

The quantification of materiality

Many of the firms observed in chapter 3 note that they have a high number of leases to monitor. Consequently, the application of human judgment to estimates

regarding material changes in anticipated lease terms and payments is expected to prove extremely costly. This complication can be generalized to non-lease accounting phenomena in that the use of individual human attention often proves extremely burdensome.

This represents another opportunity for the application of formalization to the benefit of both firms and statement users. Assume a midsize firm has many individual building leases with similar characteristics throughout the world. Assume further that each lease must be reassessed on an annual basis to determine the likelihood of accepting lease extensions. Since this firm would prefer not to waste resources by sending men and women out to each location to reassess current conditions and calculate extension probability, it instead generates an algorithm that uses existing data to update the certainty coefficient of lease extensions. For example, if a location's sales in a given area – a quantifiable, measurable item – are shrinking, the certainty of renewal may decrease. Conversely, growing sales may cause the firm to be more certain of term extensions.

The concept of quantification of judgment and anticipation is already in practice in the case of receivables aging. Firms apply a predetermined uncollectibility percentage to a given account or group of accounts based on age. It is simply impracticable to analyze each account, especially if a firm has thousands or millions of open accounts.

Quantification of judgment, when used in conjunction with formalization and a proper ontology, yields several benefits. Shareholders will be able to judge the adequacy of their firm's materiality determinations for themselves. In the long term, they will be able to assess management's ability to accurately quantify and predict future events. If a firm is perpetually over-conservative, shareholders can control for such conservatism in

valuation.

Firms will also benefit through cost reduction, uniformity of standard application, and verifiability. Since the universe of monitored variables is entirely quantifiable, the development of thresholds and algorithms based upon those variables will enjoy improved simplicity and applicability. The role of judgment can be clarified to refer to the development and improvement of these automated systems, in a manner not unlike the use of expert systems. The creation of rules may lighten the administrative burden on firms while at the same time providing a framework that can be easily assessed by auditors, compared with peer firms, and eventually submitted to financial statement users.

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Appendix A: Paragraphs 3—8 of FIN 48

3. This Interpretation applies to all tax positions accounted for in accordance with Statement 109.

4. The term *tax position* as used in this Interpretation refers to a position in a previously filed tax return or a position expected to be taken in a future tax return that is reflected in measuring current or deferred income tax assets and liabilities for interim or annual periods. A tax position can result in a permanent reduction of income taxes payable, a deferral of income taxes otherwise currently payable to future years, or a change in the expected realizability of deferred tax assets. The term *tax position* also encompasses, but is not limited to:

- a. A decision not to file a tax return
- b. An allocation or a shift of income between jurisdictions
- c. The characterization of income or a decision to exclude reporting taxable income in a tax return
- d. A decision to classify a transaction, entity, or other position in a tax return as tax exempt.

Recognition

5. The appropriate unit of account for determining what constitutes an individual tax position, and whether the more-likely-than-not recognition threshold is met for a tax position, is a matter of judgment based on the individual facts and circumstances of that position evaluated in light of all available evidence. The determination of the unit of account to be used in applying the provisions of this Interpretation shall consider the manner in which the enterprise prepares and supports its income tax return and the approach the enterprise anticipates the taxing authority will take during an examination.

6. An enterprise shall initially recognize the financial statement effects of a tax position when it is more likely than not, based on the technical merits, that the position will be sustained upon examination. As used in this Interpretation, the term *more likely than not* means a likelihood of more than 50 percent; the terms *examined* and *upon examination* also include resolution of the related appeals or litigation processes, if any. The more-likely-than-not recognition threshold is a positive assertion that an enterprise believes it is entitled to the economic benefits associated with a tax position. The determination of whether or not a tax position has met the more-likely-than-not recognition threshold shall consider the facts, circumstances, and information available at the reporting date.

7. In assessing the more-likely-than-not criterion as required by paragraph 6 of this Interpretation:

- a. It shall be presumed that the tax position will be examined by the relevant taxing authority that has full knowledge of all relevant information.

- b. Technical merits of a tax position derive from sources of authorities in the tax law (legislation and statutes, legislative intent, regulations, rulings, and case law) and their applicability to the facts and circumstances of the tax position. When the past administrative practices and precedents of the taxing authority in its dealings with the enterprise or similar enterprises are widely understood, those practices and precedents shall be taken into account.
- c. Each tax position must be evaluated without consideration of the possibility of offset or aggregation with other positions.

Measurement

- 8. A tax position that meets the more-likely-than-not recognition threshold shall initially and subsequently be measured as the largest amount of tax benefit that is greater than 50 percent likely of being realized upon settlement with a taxing authority that has full knowledge of all relevant information. Measurement of a tax position that meets the more-likely-than-not recognition threshold shall consider the amounts and probabilities of the outcomes that could be realized upon settlement using the facts, circumstances, and information available at the reporting date. As used in this Interpretation, the term *reporting date* refers to date of the enterprise's most recent statement of financial position.

Appendix B: Paragraphs 505-30-30-1—30-4 of FASB Codification

30-1 This Section provides guidance on measuring amounts that arise from repurchases of an entity's own outstanding common stock. The measurement issues addressed include both of the following:

- a. Determining the allocation of amounts paid to the repurchased shares and other elements of the repurchase transaction
- b. Further allocation of amounts allocated to repurchased shares to various components of stockholder equity upon formal or constructive retirement

30-2 An allocation of repurchase price to other elements of the repurchase transaction may be required if an entity purchases treasury shares at a stated price significantly in excess of the current market price of the shares. An agreement to repurchase shares from a shareholder may also involve the receipt or payment of consideration in exchange for stated or unstated rights or privileges that shall be identified to properly allocate the repurchase price.

30-3 For example, the selling shareholder may agree to abandon certain acquisition plans, forego other planned transactions, settle litigation, settle employment contracts, or restrict voluntarily the ability to purchase shares of the entity or its affiliates within a stated time period. If the purchase of treasury shares includes the receipt of stated or unstated rights, privileges, or agreements in addition to the capital stock, only the amount representing the fair value of the treasury shares at the date the major terms of the agreement to purchase the shares are reached shall be accounted for as the cost of the shares acquired. The price paid in excess of the amount accounted for as the cost of treasury shares shall be attributed to the other elements of the transaction and accounted for according to their substance. If the fair value of those other elements of the transaction is more clearly evident, for example, because an entity's shares are not publicly traded, that amount shall be assigned to those elements and the difference recorded as the cost of treasury shares. If no stated or unstated consideration in addition to the capital stock can be identified, the entire purchase price shall be accounted for as the cost of treasury shares.

30-4 Transactions do arise, however, in which a reacquisition of an entity's stock may take place at prices different from routine transactions in the open market. For example, to obtain the desired number of shares in a tender offer to all or most shareholders, the offer may need to be at a price in excess of the current market price. In addition, a block of shares representing a controlling interest will generally trade at a price in excess of market, and a large block of shares may trade at a price above or below the current market price depending on whether the buyer or seller initiates the transaction. An entity's reacquisition of its shares in those circumstances is solely a

treasury stock transaction properly accounted for at the purchase price of the treasury shares. Therefore, in the absence of the receipt of stated or unstated consideration in addition to the capital stock, the entire purchase price shall be accounted for as the cost of treasury shares.

Appendix C: Section S99-2 of FASB Codification

S99-2 The following is the text of Regulation S-X Rule 5-03, Income Statements.

- (a) The purpose of this rule is to indicate the various line items which, if applicable, and except as otherwise permitted by the Commission, should appear on the face of the income statements filed for the persons to whom this article pertains (see § 210.4-01(a)).
- (b) If income is derived from more than one of the subcaptions described under § 210.5-03.1, each class which is not more than 10 percent of the sum of the items may be combined with another class. If these items are combined, related costs and expenses as described under § 210.5-03.2 shall be combined in the same manner.
- 1. Net sales and gross revenues. State separately:
 - (a) Net sales of tangible products (gross sales less discounts, returns and allowances),
 - (b) operating revenues of public utilities or others;
 - (c) income from rentals;
 - (d) revenues from services; and
 - (e) other revenues.
- Amounts earned from transactions with related parties shall be disclosed as required under § 210.4-08(k).
- A public utility company using a uniform system of accounts or a form for annual report prescribed by federal or state authorities, or a similar system or report, shall follow the general segregation of operating revenues and operating expenses reported under § 210.5-03.2 prescribed by such system or report.
- If the total of sales and revenues reported under this caption includes excise taxes in an amount equal to 1 percent or more of such total, the amount of such excise taxes shall be shown on the face of the statement parenthetically or otherwise.
- 2. Costs and expenses applicable to sales and revenues.
- State separately the amount of
 - (a) cost of tangible goods sold,
 - (b) operating expenses of public utilities or others,
 - (c) expenses applicable to rental income,
 - (d) cost of services, and
 - (e) expenses applicable to other revenues.
- Merchandising organizations, both wholesale and retail, may include occupancy and buying costs under caption 2(a). Amounts of costs and expenses incurred from transactions with related parties shall be disclosed as required under § 210.4-08(k).

- 3. Other operating costs and expenses. State separately any material amounts not included under caption 2 above.
- 4. Selling, general and administrative expenses.
- 5. Provision for doubtful accounts and notes.
- 6. Other general expenses. Include items not normally included in caption 4 above. State separately any material item.
- 7. Non-operating income.
- State separately in the income statement or in a note thereto amounts earned from
 - (a) dividends,
 - (b) interest on securities,
 - (c) profits on securities (net of losses), and
 - (d) miscellaneous other income.
- Amounts earned from transactions in securities of related parties shall be disclosed as required under § 210.4–08(k). Material amounts included under miscellaneous other income shall be separately stated in the income statement or in a note thereto, indicating clearly the nature of the transactions out of which the items arose.
- 8. Interest and amortization of debt discount and expense.
- 9. Non-operating expenses.
- State separately in the income statement or in a note thereto amounts of
 - (a) losses on securities (net of profits) and
 - (b) miscellaneous income deductions.
- Material amounts included under miscellaneous income deductions shall be separately stated in the income statement or in a note thereto, indicating clearly the nature of the transactions out of which the items arose.
- 10. Income or loss before income tax expense and appropriate items below.
- 11. Income tax expense. Include under this caption only taxes based on income (see § 210.4–08(h)).
- 12. Equity in earnings of unconsolidated subsidiaries and 50 percent or less owned persons. State, parenthetically or in a note, the amount of dividends received from such persons. If justified by the circumstances, this item may be presented in a different position and a different manner (see § 210.4–01(a)).
- 13. Income or loss from continuing operations.
- 14. Discontinued operations.
- 15. Income or loss before extraordinary items and cumulative effects of changes in accounting principles.
- 16. Extraordinary items, less applicable tax.
- 17. Cumulative effects of changes in accounting principles.
- 18. Net income or loss.
- 19. Net income attributable to the noncontrolling interest.
- 20. Net income attributable to the controlling interest.
- 21. Earnings per share data.
- [45 FR 63671, Sept. 25, 1980, as amended at 45 FR 76977, Nov. 21, 1980; 50 FR 25215, June 18, 1985]

Appendix D: Paragraphs 605-50-25-10—25-12 of FASB Codification

25-10 A rebate or refund of a specified amount of cash consideration that is payable pursuant to a binding arrangement only if the customer completes a specified cumulative level of purchases or remains a customer for a specified time period shall be recognized as a reduction of the cost of sales based on a systematic and rational allocation of the cash consideration offered to each of the underlying transactions that results in progress by the customer toward earning the rebate or refund provided the amounts are probable and reasonably estimable. If the rebate or refund is not probable and reasonably estimable, it shall be recognized as the milestones are achieved.

25-11 The ability to make a reasonable estimate of the amount of future cash rebates or refunds depends on many factors and circumstances that will vary from case to case. However, any of the following factors may impair a customer's ability to determine whether the rebate or refund is probable and reasonably estimable:

- a. The rebate or refund relates to purchases that will occur over a relatively long period.
- b. There is an absence of historical experience with similar products or the inability to apply such experience because of changing circumstances.
- c. Significant adjustments to expected cash rebates or refunds have been necessary in the past.
- d. The product is susceptible to significant external factors (for example, technological obsolescence or changes in demand).

25-12 Changes in the estimated amount of cash rebates or refunds and retroactive changes by a vendor to a previous offer (an increase or a decrease in the rebate amount that is applied retroactively) are changes in estimate that shall be recognized using a cumulative catch-up adjustment. That is, the customer would adjust the cumulative balance of its rebate recognized to the revised cumulative estimate immediately. Entities shall consider whether any portion of the cumulative effect adjustment affects other accounts (inventory, for example), in which case only a portion of that adjustment would be reflected in the income statement.

Appendix E: Redacted lease document

Lease

Report Date: 3/1/2012

Status Note

Number Days Before Lease Expires: 4,016

Status Note: 1) Confirm LCD/RCD/LED - for abstract purposes, used 11/9/11 as LCD, 2/6/12 as RCD & 2/28/23 as LED. (90 days after lease execution per paragraph 17.1).

Lease Information

Lease ID:	16,234	Sec. 467 Lease:	
Client Lease ID:	141-OHCLE-001	Building Owner:	
Entity Relation:		Building Rentable Area:	128,000
Lease Name:		Landlord:	
Building Address 1:		Landlord Address:	
Building Address 2:		Date Lease Prepared:	12/14/2011
City:		Prepared by:	ksm
State:		Viewed by:	kw
Zip:		Last Modified Info:	1/13/2012 11:51:53 AM
County:			
Country:	United States		

Tenant Space Information

Floor:	2nd	Admin Capacity:	0
Unit/Suite #:	N/A	Classroom Capacity:	0
Usable Area:	1.00	Enrollment:	0.00
Rentable Area:	30,933.00	Space Details:	

Tenant Information

Tenant Hierarchy:	
Tenant Legal Name:	
Tenant Parent:	
Tenant Type:	
Tenant DBA:	

Term, Lease Index & Notes

Lease Agreement Date:	11/9/2011	Occupancy Date:	
Lease Commencement Date:	11/9/2011	Acquisition Date:	

Lease

Report Date: 3/1/2012

Rent Commencement Date: 2/6/2012

Lease Status: Active

Current Commencement Date: 11/9/2011

Lease Exec Status: Original

Lease Expiration Date: 2/28/2023

Lease Type: Prime

Term: 11 years, 3 months, 20 days

Lease Recovery Type: NNN

Lease Index Comment:

1) Lease Agreement dated 11/9/2011 between [REDACTED]

Term Comment:

11 Years from RCD, including any partial calendar month. (Lease, p. 2, sec. 1.1)

GL Recurring Events**GL Scheduled Recurring and One Time Events**

Code	Category	Name	Begin Date	End Date	Amount	Frequency	Amt/Unit	Vendor
[REDACTED]	Rent	Abated Rent	2/6/2012	12/31/2012	\$-43,177.31	Monthly	-16.75	[REDACTED]
[REDACTED]	Rent	Rent: Rent	2/6/2012	2/28/2014	\$43,177.31	Monthly	16.75	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2014	2/28/2015	\$44,053.75	Monthly	17.09	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2015	2/29/2016	\$44,930.18	Monthly	17.43	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2016	2/28/2017	\$45,832.40	Monthly	17.78	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2017	2/28/2018	\$46,734.61	Monthly	18.13	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2018	2/28/2019	\$47,662.60	Monthly	18.49	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2019	2/29/2020	\$48,616.37	Monthly	18.86	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2020	2/28/2021	\$49,595.91	Monthly	19.24	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2021	2/28/2022	\$50,601.23	Monthly	19.63	[REDACTED]
[REDACTED]	Rent	Base Rent	3/1/2022	2/28/2023	\$51,606.56	Monthly	20.02	[REDACTED]

GL Scheduled Payments by Month and Category

2-2012	3-2012	4-2012	Total
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Lease

Report Date: 3/1/2012

Rent	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00

GL Scheduled Payments by Year and Category

	Rent	Total
2012	0.00	0.00
2013	518,127.72	518,127.72
2014	526,892.12	526,892.12
2015	537,409.30	537,409.30
2016	548,184.36	548,184.36
2017	559,010.90	559,010.90
2018	570,095.22	570,095.22
2019	581,488.90	581,488.90
2020	593,191.84	593,191.84
2021	605,204.12	605,204.12
2022	617,268.06	617,268.06
2023	103,213.12	103,213.12
Total	5,760,085.66	5,760,085.66

Currency/Units

Currency Type: United States Dollars
Units: SF

Options

Termination Notice (Days): 366
Termination Fee: \$0.00
Termination Note: ONE-TIME: TT shall have the right to terminate effective as of the last day of the 5th Lease Year (2/28/2017) by delivering written notice on or before the date 12 months prior (2/28/2016) to the last day of the 5th Lease Year. Termination Fee shall equal the unamortized portion of LL's transaction costs (TIA & Commissions) as of the last day of the 5th lease year plus an amount equal to 3 months of the Base Rent which would have been payable during the 6th Lease Year with interest at a rate of 6%/annum. (Lease, p. 9, sec. 2.4)
Early Termination Date: 2/28/2017
Renewal Notice (Days): 180
Renewal Options (Remaining): 2

Lease

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Renewal Note:

TT shall have the right to extend for 2 consecutive periods of 5 years each by written notice of not less than 180 days (8/31/2022) prior to the expiration of current lease term. (Lease, p. 9, sec. 2.3) Rent during Renewal Term shall be 90% of FMV with 2% annual increases. (Lease, p. 16, sec. 3.10)

Renewal Term:

5

Renewal Type:

Market

Purchase Option:

Silent

Rights of First Offer/Refusal/Expansion:

ROFR: If "Expansion Area" becomes available subsequent to the LCD, LL shall notify TT in writing of the third party's offer to lease the Expansion Area. TT shall have 7 business days to lease and accept. (Lease, p. 11, sec. 2.6)

Relocation:

ROFO: In the event that the any space within the Building shall become available subsequent to the RCD, LL shall offer the Available Space to TT prior to entering into lease negotiations with a third party. TT shall have 7 business days to lease and accept. (Lease, p. 12, sec. 2.6) Expansion Area (Lease, Exhibit H)

Exclusive:

LL reserves the right at any time to relocate the various buildings, parking area and other areas of the Building Complex. (Lease, p. 9, sec. 2.1)

Expansion:

Neither LL nor any of its affiliates will lease space or otherwise permit space in or upon the Building to be used by any tenant (including any permitted assignee or sublessee of such tenant) or occupant whose use is the operation of a for-profit educational facility. (Lease, p. 43, sec. 21)

In the event that the any space within the Building shall become available subsequent to the RCD, LL shall offer the Available Space to TT prior to entering into lease negotiations with a third party. . (Lease, p. 12, sec. 2.6)

Contraction:

ONE-TIME: TT shall have the right to contract the SF by up to 40% effective as of the last day of the 5th Lease Year (2/28/2017); provided that LL and TT shall cooperate in good faith to ensure that the contracted space is reasonably leasable space (not less than 4,000 SF in any area) and has direct access to the entrance/exit corridors of the Building, and, if possible, is contiguous to any vacant space within the building and/or a building Common Area. TT shall provide notice to LL of its intent to contract such space 12 months prior (2/28/2016) to contraction date along with the Contraction Fee. (Lease, p. 10, sec. 2.5)

Other Options:

ROOF ACCESS: TT shall have access to the roof to install/maintain/replace, @ TT's sole cost/expense, satellite dishes, antennas or cell towers. (Lease, p. 40, sec. 17.6)

Other Financial Information**Company Code:****Department Code:****Account Type:**

AP

Rent Adjustment Type:

Fixed

CPI Notes:

Silent

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Other Rent Notes:

Base Rent for any portion of a calendar month shall be prorated 1/30th of a monthly payment being due for each day of a partial month. (Lease, p. 13-14, sec. 3.1)

Sales Tax:**Sales Tax Applies to:****Reserved:****Rate:** \$0.00**Unreserved:** 240**Rate:** \$0.00**Total Parking Spaces:** 240**Total Parking Rate:** \$0.00**Parking Note:**

TT shall have access to no less than 240 parking spaces located at the Building Complex free of any charge and in common with other tenants of the Building. (Lease, p. 40, sec. 17.6)

Security Deposit Amount:

0.00

Security Deposit Return Date:**Security Deposit Note:**

Not required. (Lease, p. 17, sec. 4)

Rent Abatement:

Base Rent: As of RCD and recommence on 1/1/2013. (Lease, p. 16, sec. 3.8.i)

OpEx: As of RCD and recommence on 9/1/2012. (Lease, p. 16, sec. 3.8.ii)

Late Fee:

5% of unpaid sum if not paid within 5 days after written notice. (Lease, p. 15, sec. 3.7) Interest equal to the lesser of (a) 12% per annum, or (b) the highest lawful rate of interest. (Lease, p. 30, sec. 10.9)

TI Amount PSF:

\$50.00

TI Amount Total:

\$1,546,650.00

TI Reimbursed by LL:**Tenant Improvement Allowance:**

\$50.00 per RSF (\$1,546,650). If TIA exceeds build-out costs, TT may either apply the remainder toward the cost of TT's work or as a credit against Base Rent until exhausted. TT shall have 12 months from Substantial Completion Date to request that such Latent Defects be corrected by LL @ LL's expense. (Lease, p. 3, sec. 1.1; p. 35-36, sec. 17) LL shall, @ LL's sole cost, construct the common restrooms to be located on the 2nd floor of the Building outside of the Premises. (Lease, p. 40, sec. 17.8) LL shall, @ LL's sole cost/expense, construct/install one (1) additional exterior light fixture to be located on the northern facade of the Building at a mutually agreed location. (Lease, p. 40, sec. 17.9.i) LL shall, @ TT's sole cost/expense, install & operate a gate @ the Carnegie Avenue parking lot entrance. TT's cost to install said gate shall not exceed \$14,542.00. (Lease, p. 41, sec. 17.9.iv) On/before 6/1/2012, LL, shall @ LL's sole cost, install a fence boundary at the edge of the Building Complex along East 69th Street. (Lease, p. 41, sec. 17.9.v)

Landlord's Work (Lease, Exhibit F)
Tenant's Build-Out Plans (Lease, Exhibit G)

Operating Expenses**Tenant's Prorata Share:**

24.16% (Lease, p. 7, sec. 1.1)

Lease

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CAM:

TT to pay PRS of OpEx. OpEx for the 1st Lease Year shall not exceed \$4.85/sf. 4% cap on controllable expenses (after 2nd Lease Year). Controllable expenses excludes impositions (taxes), utilities, snow removal, security & insurance costs. (Lease, p. 6, sec. 1.1)

Real Estate Taxes:

TT shall pay PRS. (Lease, p. 5, sec. 1.1) Real taxes for calendar years 2012 & 2013 shall not exceed \$2.21 per SF. TT shall be responsible for actual real taxes beginning in calendar year 2014. (Lease, p. 6, sec. 1.1)

Management Fee:

Included in OpEx, not to exceed 3% of Base Rent and OpEx for any Lease Year. (Lease, p. 4, sec. 1.1)

Audit Rights Notes:

Within 90 days after receiving LL's statement of actual OpEx for a particular calendar year, TT shall have the right to provide LL with written Review Notice of its intent to review LL's books and records relating to the OpEx for such calendar year. TT shall have the right to perform such review or audit of LL's books, records and documents as provided for not more than once during each calendar year. LL to make books/records available within 30 days of TT's Review Notice. If review determines an overcharge in excess of 3% of the total OpEx, LL shall be solely responsible for any/all costs incurred by TT or TT's agent in connection with such review, not to exceed \$1,500. (Lease, p. 14-15, sec. 3.2.iii)

Financial Statements:

Provided that TT's financial statements are not available to be obtained online via the Internet, TT will provide LL with annual financial statements prepared by outside accountants within 120 days of TT's year-end and TT will also provide LL with financial statements prepared by outside accountants upon request of LL's lenders. (Lease, p. 25, sec. 7.13)

Signage:

TT shall have the right to install TT's signage at the Premises (which signage may include, subject to the terms and conditions, limited way finding signage on the exterior facade of Building and TT identification signage on the exterior facade of the Building facing [REDACTED]). Upon written notice to LL within 30 days of TT's receipt by LL offer of monument sign space, TT shall have the right to have LL install, @ TT's sole cost/expense, one (1) sign panel on each Monument Sign. Upon LL obtaining, @ TT's sole cost/expense, required permits/approvals, LL shall install/maintain, at TT's sole cost/expense, a sign on the Billboard Structure announcing TT's occupancy in the building for a period not to exceed one (1) year from LCD. All TT signage shall be installed & maintained by LL, at TT's sole cost/expense. (Lease, p. 39, sec. 17.5)

HVAC Provision:

TT shall be responsible for its own utility usage from Building's HVAC units, which will be submetered & separately reconciled. (Lease, p. 17-18, sec. 5.1)

Utilities:

Part of OpEx. (Lease, p. 18, sec. 5.4.i.b)

Electric:

TT shall pay all costs with respect to same. (Lease, p. 17, sec. 5.1)

Water/Sewer:

Silent

Gas:

Silent

Janitorial:

Part of OpEx and reimbursable by TT. (Lease, p. 18, sec. 5.2)

Lease Contacts**Lease Contacts**

Lease

Report Date: 3/1/2012

Type	Company Name	Attention To	Address	Phone	Fax	Email
LL Notice	[REDACTED]	[REDACTED]	[REDACTED] United States			
	Fed ID:			Notes:		
LL Notice CC	[REDACTED]	[REDACTED]	[REDACTED] United States			
	Fed ID:			Notes:		
Payee	[REDACTED]	[REDACTED]	[REDACTED]			
	Fed ID:			Notes:		
Property Manager	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
	Fed ID:			Notes:		

Notices**Notices:**

All notices, consents, approvals, or other communication required shall be in writing and shall be given by registered or certified mail or by [REDACTED] or other recognized overnight courier. (Lease, p. 33, sec. 12)

Restrictions**Permitted Use:**

For post secondary education including classrooms, administrative offices, and possible lab uses and any business uses that provide services incidental to any of the foregoing Permitted Uses. (Lease, p. 3, sec. 1.1)

Prohibited Use:

In no event shall TT's use of the Premises consist of any of the following prohibited activities or businesses: operation of any private or commercial golf course; country club; massage parlor; hot tub facility, suntan facility; race track or other facility used for gambling; any store the principal business of which is the sale of alcoholic beverages for consumption off premises; or the rental to others in the Premises of residential property. (Lease, p. 20, sec. 7.2)

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Hazardous Material:

TT shall not cause or permit the escape, disposal, release or threat of release of any biologically or chemically active or other Hazardous Materials on, in, upon or under the Premises or the Building Complex. Tenant shall not allow the generation, storage, use or disposal of such Hazardous Materials in any manner, nor allow to be brought into the Premises or the Building Complex any such Hazardous Materials. (Lease, p. 42, sec. 19)

Premise Rights**Assignee/Sublessee:**

WITH LL CONSENT: TT may not assign, mortgage, pledge, encumber, sublet or otherwise transfer the Premises, nor any part thereof without the prior written consent of LL.

WITHOUT LL CONSENT: TT shall have the right to assign the Lease or sublet the Premises or any part thereof without the prior consent of LL to either (x) an entity into or with which TT is merged or consolidated, or to which all or substantially all of TT's assets are transferred, or (y) any entity which controls or is controlled by TT or is under common control with TT.

If TT intends to assign/sublease 50% or more of the Premises, TT to pay LL for actual/reasonable legal fees incurred by LL in connection with such assignment/sublease. LL to receive 50% of any excess rents. TT to remain liable (Lease, p. 32, sec. 11)

Alterations:

WITH LL CONSENT: TT shall have no authority, without the express written consent of LL to alter, remodel, reconstruct, demolish, add to, improve or otherwise change the Premises, except that TT shall have such authority, without the consent of LL, to make repairs to the Premises and do such things as are appropriate to comply with the obligations imposed on TT under other provisions of the Lease.

WITHOUT LL CONSENT: TT shall have the right to make minor non-structural Alterations from time to time in the Premises which do not affect the Building systems without obtaining LL's prior written consent. Such minor alterations may not exceed \$150K in any 12-month period. (Lease, p. 24, sec. 7.12)

Surrender:

TT shall peaceably to surrender the Premises clean and in good order, repair and condition, reasonable wear and tear and damage by fire or casualty or taking excepted and to deliver to LL all keys to the Premises or any part thereof. If LL fails to notify TT, TT shall have no obligation to remove any tenant improvements and restore the Premises as a result of such removal. TT, @ TT's sole cost/expense, shall remove any alterations designated by LL to be removed and repair any damage caused by such removal. (Lease, p. 22, sec. 7.8) All TT signage shall be removed by LL, @ TT's sole cost/expense, upon expiration/earlier termination of the Lease. (Lease, p. 40, sec. 17.5)

ARO:

\$0.00

Lease

Report Date: 3/1/2012

Casualty:

In the event that the Premises are totally damaged or destroyed by fire or other casualty or substantially damaged so as to render them or a material portion thereof untenable, then there shall be a just and proportionate abatement of the Rent payable. In the event of any casualty damage to the Premises, LL shall proceed at its expense and with reasonable diligence to repair and restore the Premises (not including TT's trade fixtures, business equipment and furniture) to substantially the same condition they were in immediately prior to such casualty. Notwithstanding the foregoing, if LL in its sole discretion determines that timely restoration is not possible or practical or that there are or will be insufficient insurance proceeds available to LL to accomplish same, then LL shall have the right to terminate the Lease by written notice given to TT within 60 days after the occurrence of such casualty. In the event the Premises have not been restored to a condition substantially suitable for their intended purpose within 180 days following the issuance of all permits required for such restoration, then either LL or TT may terminate the Lease by written notice given to the other within 5 business days following such 180 day period. (Lease, p. 26, sec. 9.1) Force Majeure. (Lease, p. 43, sec. 20) Refer to Lease. (Lease, p. 27, sec. 9.2)

Eminent Domain:

Subordination:

Lease shall be subordinate to any mortgage, deed of trust or ground lease or similar encumbrance from time to time encumbering the Premises, whether executed and delivered prior to or subsequent to the date of this Lease. (Lease, p. 22, sec. 7.9.i)

Estoppel Certificate:

Upon not less than 15 days' prior written request by LL. (Lease, p. 24, sec. 7.10)

Go Dark Note:

Silent

Other: Non-Financial

Default - Monetary:

5 business days following written notice. LL shall not be obligated to provide notice to TT more than 2 times during any 12-month period. (Lease, p. 27, sec. 10.1)

Default - Non-Monetary:

30 days after written notice from LL. (Lease, p. 28, sec. 10.1)

Landlord Rights:

LL and its authorized agents, employees, subcontractors and representatives shall have the right to enter the Premises at any time during emergencies and at all reasonable times with prior notice to make necessary repairs, exhibit the Premises to prospective tenants (during the last 12 months of the Lease Term), and show the Premises to prospective lenders, brokers, agents, buyers or persons interested in an exchange, at any time during the Lease Term. (Lease, p. 35, sec. 16) Tenant at sufferance; @ 150% daily rate of Rent. (Lease, p. 25, sec. 7.14)

Holdover Provision:

Landlord Liens:

Silent

Other:

Silent

Operating/Insurance

Lease

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Landlord Maintenance:

LL, at its sole cost, shall make all structural repairs and replacements to the roof, walls and foundations of the Premises, unless the same are caused by TT and/or TT employees, contractors, agents or invitees. In performing its obligations under this Article or elsewhere under the Lease, LL shall not unreasonably interfere with TT's normal business operations. LL, as part of OpEx, shall maintain the non-structural components of the Premises and mechanical systems of the Building and perform all other maintenance required/needed at the Premises or in the Building. (Lease, p. 18, sec. 5.4.i.a & b)

Tenant Maintenance:

TT shall keep the Premises in good working order and condition (reasonable wear and use and damage by fire or other casualty or eminent domain only excepted), including the replacement of all light bulbs and ballasts as necessary, unless the need for the same arises from the negligence or willful misconduct of LL (or LL's agents, employees or other tenants), in which case LL shall be responsible for the cost of the same. (Lease, p. 19, sec. 5.4.ii)

Landlord Insurance:

(a) ALL RISK INSURANCE against damage by fire or other casualty in an amount at least equal to the replacement cost of the Premises as determined from time to time by Landlord or (at LL's election or upon TT's request) by appraisal made at the expense of TT by an accredited insurance appraiser approved by LL. Landlord shall also obtain COMPREHENSIVE

(b) PUBLIC LIABILITY INSURANCE insuring against liability for injury to persons and damage to property with limits of at least \$1M for property damage, \$1M for injury or death of one person, and \$2M in the aggregate. (Lease, p. 20, sec. 6.5)

Tenant Insurance:

(a) COMPREHENSIVE PUBLIC LIABILITY INSURANCE insuring against liability for injury to persons and damage to property with limits of at least \$1M for property damage, \$ 1M for injury or death of one person, and \$2M in the aggregate, or such higher limits in any case as may reasonably be required;

(b) WORKMEN'S COMPENSATION covering all TT's employees working at the Premises;

(c) SUCH ADDITIONAL INSURANCE (including, without limitation, rent loss insurance) as

LL or LL's Mortgagee shall reasonably require. (Lease, p. 19, sec. 6.1)

Additional Memos

Lease Memos

Memo Description

Memo

John Peter Krahel
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Born 9/29/1985, North Shore Hospital, Manhasset, NY

Education:

Rider University, Lawrenceville, NJ
Masters of Accountancy, August 2008
B.A., English December 2006

Publications:

Consequences of XBRL Standardization on Financial Statement Data, with David Chan and Miklos A. Vasarhelyi. 2012. *Journal of Information Systems*. Vol. 26, Issue 1, pp. 155-167.

Digital Standard Setting: The Inevitable Paradigm, with Miklos A. Vasarhelyi. 2011. *International Journal of Economics and Accounting*. Vol. 2, Issue 3, pp. 242-254.

Audit Education and the Real-Time Economy, with Miklos A. Vasarhelyi and Ryan A. Teeter. 2010. *Issues in Accounting Education*. Vol. 25, Issue 3, pp. 405-423.

Current position:

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