

## Assurance on XBRL-Related Documents: The Case of United Technologies Corporation

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# Assurance on XBRL-Related Documents: The Case of United Technologies Corporation

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**ABSTRACT:** The eXtensible Business Reporting Language (XBRL) was developed to provide financial information users with a standardized method to prepare, publish, and exchange business information in digital format. XBRL is being used around the world for financial reporting and government e-filings. Although there has been growing awareness about assurance issues related to the use of XBRL, current audit practices and standards fall short of providing the needed guidance for the provision of assurance on XBRL-Related Documents. In this paper, we report on a mock assurance engagement that we conducted on the XBRL-Related Documents of United Technologies Corporation's 10-Q for the third quarter of 2005 and repeated on its 10-Q for the third quarter of 2008 to identify the issues that companies and auditors might encounter if they are requested to provide assurance on XBRL-Related Documents. We describe the assurance framework applied in the mock assurance engagement, present the findings from the examination process, and discuss future research opportunities associated with XBRL documents assurance.

**Keywords:** XBRL (eXtensible Business Reporting Language); assurance; case study.

**Data Availability:** Data available from public sources.

## I. INTRODUCTION

**A**cross the world, regulators and government agencies are increasingly implementing XBRL for regulatory filings, and many software developers are launching XBRL applications onto the market (XBRL International 2007). For instance, on December 17, 2008, the U.S. Securities and Exchange Commission (SEC) mandated the use of interactive data (i.e., XBRL) for the financial reporting of all U.S. public companies by December 2011 (SEC 2008). The U.K. announced that it plans to make XBRL mandatory for

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company tax filings in 2010 (XBRL International 2006b). The Canadian Securities Administrators (CSA) launched an XBRL voluntary filing program on January 19, 2007 (CSA 2007), and Korea instituted a voluntary XBRL program in October 2007 (SEC 2007). The Tokyo Stock Exchange (TSE) introduced an XBRL reporting system in 2006 (XBRL International 2006a). China already requires interactive data filing for the full financial statements of all listed companies in quarterly, half-year, and annual reports (SEC 2007).

The growth of XBRL use and its potential to replace *paper paradigm*<sup>1</sup> documents raises important assurance issues related to the XBRL-tagged information (Boritz and No 2004; Elliott 2002; Farewell and Pinsker 2005; McGuire et al. 2006; Pinsker 2003; Plumlee and Plumlee 2008). For instance, the SEC's new rule for XBRL reporting did not require independent assurance for XBRL-Related Documents and providers of XBRL-Related Documents will not be responsible for antifraud claims by users if inaccurate XBRL-Related Documents are provided with good faith. For this reason, Luis Aguilar, one of the SEC Commissioners who opposed the new rules, stated that "limiting liability puts investors at greater risk for misleading disclosures and for suffering losses" (*CFO Magazine* 2008).

In March 2005, the SEC launched the Voluntary XBRL Filing Program (hereafter, VFP), which enabled voluntary filers to *furnish* XBRL-Related Documents (i.e., XBRL instance documents, taxonomy schema, linkbase files,<sup>2</sup> and perhaps an independent auditor's report) on EDGAR in addition to official *filings* such as 10-K and 10-Q (SEC 2005). The main purpose of the VFP was to encourage companies to experiment with and learn from the process of creating XBRL filings and to assist the SEC in assessing the feasibility of XBRL as a potential filing format in the future (Debrecey et al. 2005).

Under the SEC's VFP, companies first create the official financial statements using their internal financial reporting system and then create XBRL-Related Documents by mapping the information in the official financial statements to elements in XBRL taxonomies. This study focuses on this conversion process; in particular, the issues that may arise if the company requests the auditor to provide assurance on the XBRL-Related Documents. We selected United Technologies Corporation's filing (hereafter, UTC) to serve as the subject of a research case and performed examination procedures to mimic the steps that an auditor would need to perform in an assurance engagement to determine that the XBRL-Related Documents were a complete and accurate reflection of its official *paper paradigm* filing.

The next section addresses assurance issues related to XBRL. This is followed by details of our case company, UTC, including a description of its 10-Q filing for the third quarter of 2005 and the examination procedures we used in this study. We also report the results of reperforming some of these examination procedures on UTC's 10-Q filing for Q3 of 2008, which was based on the latest taxonomy developed by XBRL-U.S. We then summarize our findings and recommendations and conclude with a discussion of main issues and suggestions for future research in this area.

## II. XBRL, BUSINESS REPORTING, AND ASSURANCE

### XBRL and Electronic Filings

A typical paper paradigm filing contains several key types of information, some of which are assured, and some of which are not. In addition to the financial statements, a

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<sup>1</sup> We use the term *paper paradigm* throughout this paper to represent traditional financial statements and electronic versions of those statements in HTML, pdf, or other such electronic presentation formats.

<sup>2</sup> Brief descriptions of XBRL concepts are given in the Appendix.

filing can contain the notes to the financial statements, MD&A, and other information required by the SEC, such as CEO and CFO certifications and other information. Review-based or audit-based assurance is provided on the paper paradigm financial statements and notes contained in the filings, whereas the MD&A is only subject to a knowledgeable read-through by the auditor to ensure that information presented in it is consistent with the financial statements.<sup>3</sup> The CEO and CFO certifications provided in the filings are not assured.

The SEC distinguishes between information that is *filed* and information that is *furnished*. The XBRL-Related Documents *furnished* under the VFP are considered exhibits to the official *filing* to which they relate. This generally means that the filer and the auditor are shielded from litigation concerns related to the information furnished under the VFP. Since the XBRL-Related Documents are not actually filings, they may not draw the same commitment to quality from the company as their official paper paradigm filings. In addition, the development of XBRL taxonomies has focused on the financial statements rather than the notes and MD&A. As a result, companies are often required to extend the approved XBRL taxonomies if they wish to include notes and MD&A in the XBRL-Related Documents they furnish under the VFP, although the VFP does not require notes or MD&A to be furnished.

In summary, when an auditor is asked to provide assurance on XBRL-Related Documents, those documents can range in scope from containing only the basic financial statements to a comprehensive package containing the financial statements, notes, MD&A, and other information. In performing an attestation or assurance engagement to verify that the XBRL-Related Documents completely and accurately reflect the paper paradigm filings, an auditor would have varying degrees of review-based or audit-based knowledge upon which to judge the appropriateness of the choices made by the company in preparing its XBRL-Related Documents. The most difficult aspects would arise from the extensions required to incorporate all of the company's paper paradigm filing in the XBRL version of that filing, particularly the extensions related to the notes and MD&A. Furthermore, an auditor needs to prepare an assurance report to express his or her opinion on XBRL-Related Documents. In the report, the auditor should identify whether the XBRL-Related Documents have been audited or reviewed, and should refer to the audit report or review report (American Institute of Certified Public Accountants [AICPA] 2003; Public Company Accounting Oversight Board [PCAOB] 2005).

### **Expected Evolution of XBRL Assurance**

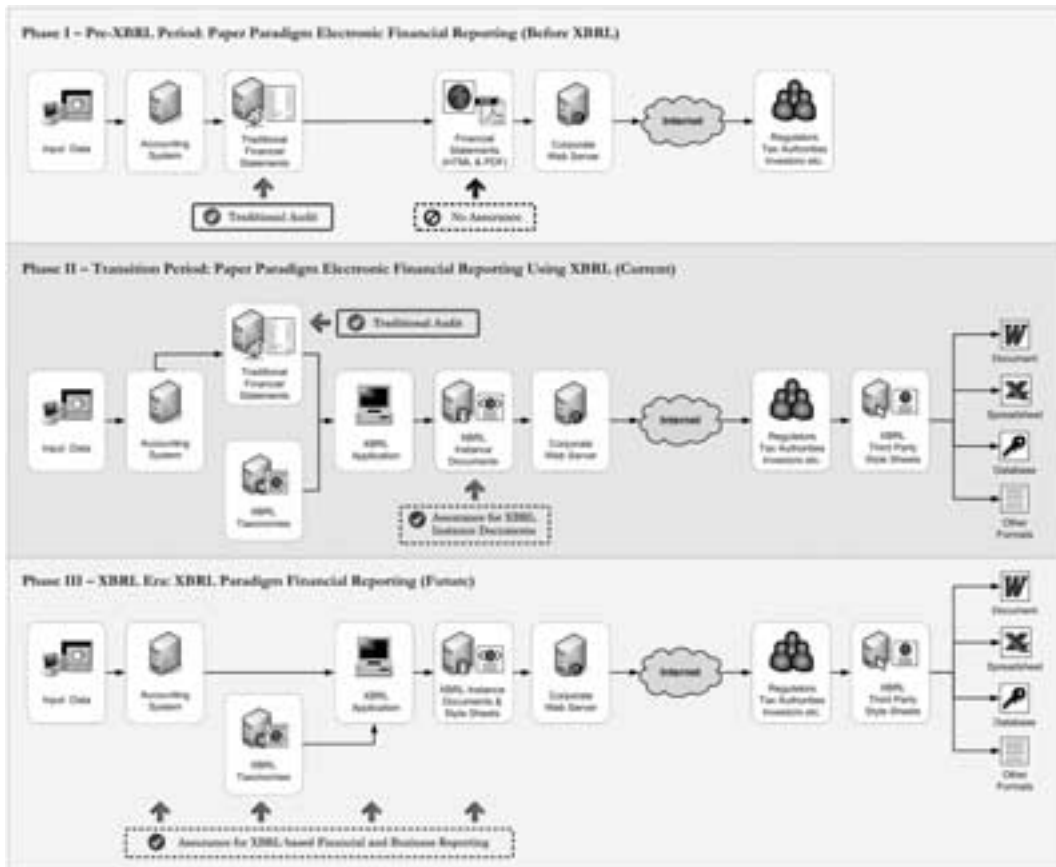
Over the past decade, regulators and government departments in many countries require electronic filings and reporting of corporate business and financial information (Canadian Institute of Chartered Accountants [CICA] 2005; International Accounting Standards Committee [IASC] 1999; Financial Accounting Standards Board [FASB] 2000). These changes have made it possible for firms to meet their stakeholders' demands for corporate transparency and to obtain several benefits such as cost efficiencies and increased accessibility of information (Beattie and Pratt 2003; Debreceeny et al. 2002; Ettredge et al. 2001). Figure 1 distinguishes three evolutionary phases in electronic financial and business reporting and assurance (Assurance Working Group of XBRL International [AWG] 2006; IASC 1999).

In the pre-XBRL period (i.e., Phase I in Figure 1), HTML or PDF versions of the financial statements are based on the paper paradigm documents and include the same

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<sup>3</sup> As discussed in AICPA's SAS No. 8.

**FIGURE 1**  
**Three Phases in Electronic Financial Reporting**



\* The solid assurance boxes represent current assurance practices and the dotted assurance boxes indicate potentially desirable, but not currently required, assurance practices.

content. The main focus of assurance practice is on whether the paper paradigm financial statements, taken as a whole, present fairly in accordance with applicable accounting principles such as GAAP or IFRS. It is noteworthy that this assurance is not extended to the same or similar information provided in HTML and PDF versions of the financial statements. To date, the auditing profession has generally avoided the provision of assurance on such electronic documents.<sup>4</sup>

The adoption of XBRL shifts the financial reporting environment from paper paradigm financial reporting to transitional paradigm financial reporting using XBRL (i.e., Phase II

<sup>4</sup> According to SAS No. 98 (AICPA 2002), electronic sites are a means of distributing information. The electronic documents posted on the sites are not documents as that term is used in Section 550. Other standards that address electronic documents are CICA 7500.15-20 (CICA 2005), AGS 1050 (Australian Accounting Research Foundation 1999), ED/AGS-1003 (Institute of Chartered Accountants of New Zealand 2003), and APB Bulletin 2001/1 (APB 2001).

in Figure 1). In this transition period, the current XBRL filings, both paper paradigm financial statements (in HTML or PDF versions) and XBRL-tagged instance documents exist concurrently. Companies first create the paper paradigm financial statements. Then, they create XBRL instance documents by mapping the information in the paper paradigm financial statements to elements in XBRL taxonomies. Users can obtain the XBRL-Related Documents (i.e., instance documents and taxonomies) over the Internet from the corporate website or other sites, such as the SEC's site,<sup>5</sup> and they can convert the instance documents into HTML, a spreadsheet, or database with appropriate stylesheets or other tools (e.g., Fujitsu IE add-in and Excel using Xinba and I-Metrics).

At present, there is no requirement to provide independent assurance on the XBRL version of the "official" financial statements in any regulatory filings around the world. Given prior research that shows that many XBRL filings contain validation exceptions, inconsistencies, and errors (Boritz and No 2008; Chou 2006), we believe it may be desirable or necessary to provide some degree of assurance on the XBRL-Related Documents in addition to the assurance provided on the original financial statements to reassure various parties such as users, management, and audit committees that the XBRL-Related Documents furnished by companies are complete and accurate translations of the original paper paradigm documents. This assurance could be in the form of attestation or assurance on XBRL-Related Documents in accordance with assurance/attestation standards or other standards such as the Public Company Accounting Oversight Board guidance (PCAOB 2005) provided for this purpose.<sup>6</sup> Under the PCAOB guidance, assurance is based on the auditor's audit- or review-based knowledge and procedures applied to the XBRL-Related Documents aimed at verifying that it is a complete and accurate translation of the paper paradigm information to the XBRL format.<sup>7</sup>

Eventually, the pervasive adoption and use of XBRL may replace the paper paradigm financial reporting, representing the next evolutionary phase of electronic business reporting, the XBRL era (i.e., Phase III in Figure 1). In this era, paper paradigm reports no longer will be generated as an intermediate product to be translated into XBRL format. Instead, XBRL-Related Documents will be created directly from the information in the accounting system and placed on the corporate website or transmitted to regulators' sites. Under the XBRL paradigm financial reporting, assurance may be needed not on the translation of the paper paradigm documents into XBRL, but directly on the process used to prepare the information in the XBRL-Related Documents. This assurance may focus on the fair presentation of the information (i.e., completely and accurately reflect the business facts) in accordance with accounting principles such as U.S. GAAP or IFRS, the compliance of XBRL-Related Documents with the relevant XBRL specifications and regulatory requirements, and the effectiveness of the XBRL generating process. Providing such assurance will need to take into account the processes used for preparing the XBRL-Related

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<sup>5</sup> The recent XBRL filings can be found at SEC's site: <http://www.sec.gov/Archives/edgar/xbrl.html>.

<sup>6</sup> In the U.S., attestation engagements are provided under Attest Engagements Section 101 (AT-101). International standards define such engagements as assurance engagements in International Standard on Assurance Engagements (ISAE) 3000.

<sup>7</sup> Auditors may read the XBRL instance document for consistency with the financial statements on which they expressed an opinion, analogous to their responsibilities for the information contained in the MD&A or "other information containing the financial statements." In the U.S., the auditor's responsibilities are discussed in SAS No. 8. However, since electronic documents such as XBRL may not be considered to be "documents" for the purposes of SAS No. 8, it is not clear whether auditors have a duty to perform such a procedure on XBRL or other electronic documents filed or furnished by the company.



Documents, including the basic underlying raw data, accounting systems, taxonomy selection, taxonomy extension creation/amendment, the tagging process, and the company's related internal controls.

The research in this paper focuses on the current phase of XBRL implementation, which involves the conversion of paper paradigm financial statements to XBRL-Related Documents and identifies the assurance issues that can arise and that need to be addressed by standard setters, regulators, practitioners, and academics. Additional issues will arise in connection with future phases of XBRL implementation, but these are outside the scope of this paper and will be addressed in future work.

### III. CASE RESEARCH METHOD

We adopted a case research approach (Benbasat et al. 1987; Yin 1994; March et al. 1991) whereby we performed mock assurance procedures to mimic some of the examination procedures that an auditor would need to perform to determine that the XBRL-Related Documents were a complete and accurate reflection of its paper paradigm government filing. We believe that a case research methodology is a useful approach due to the limited information available on applying the new XBRL technology. We follow an approach that can be replicated by other investigators since our investigation involved information contained in public filings. As recommended by Yin (1994), we gather both quantitative and qualitative information from multiple sources, including data provided by the case company, data provided by other companies in the VFP program, interviews with company personnel responsible for the XBRL filing, and interviews with members of the audit firm involved in providing assurance on the XBRL-Related Documents furnished under the SEC's VFP.

Studying practice issues in a natural setting and involving circumstances over which the research has no control helps us learn about current practices and develop an understanding of the nature and complexity of phenomena (Benbasat et al. 1987; Yin 1994). Case histories can provide an important learning opportunity that can lead to the extraction of usable knowledge, especially if investigators focus intensively on critical incidents (March et al. 1991). We believe that UTC's Q3 2005 8-K filing represents such a critical incident, as it was the first public company to have its XBRL-Related Documents furnished under the VFP assured by a public accounting firm. PricewaterhouseCoopers LLP (hereafter, PWC) carried out an attestation engagement in accordance with the PCAOB (2005) guidance and attestation standards in AT-101, paragraph 5.

#### Case Company

We selected UTC's XBRL filing under the SEC's VFP to serve as our case subject because it offered a number of valuable learning opportunities, not only about UTC's filing but about the context of the VFP and filings by other participants in the program. We analyzed UTC's filings since the inception of the voluntary XBRL filing program up to December 31, 2007. Two of UTC's filings were comprehensive, containing not just the financial statements, but the notes to the statements and the MD&A as well. The latter were not required under the VFP. The 2005-12-22 filing (for the third quarter of 2005) that is the focus of our research was the fourth filing by UTC but the first to be assured by its auditors. We noted that UTC's 2006-12-06 filing is also comprehensive and even longer in terms of the number of lines of tagged XBRL information contained in the instance document. The rest of UTC's XBRL filings except these two are less comprehensive filings containing only the basic financial statements.

Table 1 summarizes the characteristics of XBRL-Related Documents furnished by UTC in 2006 compared to several other domestic and foreign companies in the VFP.<sup>8</sup> It is apparent that UTC's XBRL-Related Documents are significantly different from the others. For example, UTC's instance document is much larger in terms of lines and elements, contains proportionately more *contexts* and *taxonomy extensions*, and includes notes, MD&A, an accountant's report, and an auditor's attestation on the XBRL document. We compared UTC to Microsoft (hereafter, MSFT), another early adopter of XBRL. MSFT's XBRL-Related Documents are similar to UTC's; for example, they include basic financial statements, notes, and MD&A. However, MSFT's instance document is much smaller than UTC's (1,339 lines versus 4,007), contains fewer taxonomy extensions (278 versus 986), contains fewer contexts (56 versus 155), and is not assured. Despite its size and complexity, UTC's XBRL-Related Documents contain no validation errors (discussed later) compared to some of the other companies in Table 1. These differences point to the uniqueness of the UTC case, and we believe that this uniqueness makes it a "critical" case for preparers, assurers, regulators, and academics (March et al. 1991). Therefore, it merits in-depth consideration to establish the state of the art in this new area as the basis for future developments.

### Case Objectives

We conducted mock assurance procedures on the XBRL-Related Documents furnished by UTC by comparing them in detail to the paper paradigm filing and, in turn, comparing the paper paradigm filing to the XBRL-Related Documents. One of our objectives was to account for every item in the paper paradigm and, *vice versa*, to account for every element in the XBRL-Related Documents. Our goal was to learn about and report on the nature and extent of the work that would be required to determine whether the translation of the paper paradigm document to the XBRL-Related Documents was complete and accurate. This involved reperforming some of the steps that PWC would have carried out prior to rendering their opinion on the XBRL-Related Documents. We interviewed UTC personnel to obtain information about such issues and have incorporated what we learned throughout this research report. We confirmed our understanding with PWC personnel involved in the XBRL program, although we were only able to obtain general, non-client-specific information from UTC's auditor due to client confidentiality issues. We believe that the approach we have taken in this research affords important insights into significant XBRL reporting and assurance issues that still need to be addressed.<sup>9</sup>

### Assurance Process

A PCAOB Staff Q&A (PCAOB 2005) that addresses attestation on XBRL-Related Documents appears to be the authoritative guidance for auditors of U.S. public companies attesting on XBRL-Related Documents and is the framework that was applied by PWC in the UTC attestation. Subsequent to the publication of the PCAOB Staff Q&A, other groups have addressed these issues. The Assurance Working Group (AWG) of XBRL International (2006) has proposed an assurance framework for electronic business reporting based on International Standard on Assurance Engagements (ISAE) 3000, which can be categorized

<sup>8</sup> Please note that our assurance work pertained to UTC's 2005-12-22 filing (i.e., 10-Q for the third quarter of 2005). Table 1 provides comparative information for 2006 because few companies participated in the VFP in 2005.

<sup>9</sup> To the extent that PWC's assurance process identified and corrected errors and omissions in UTC's initial version of the translation, our findings may understate the difficulties and issues that warrant consideration. Even so, we believe that these considerations are significant and should not be minimized.



**TABLE 1**  
**Comparison of SEC Voluntary Filings among Selected Companies and Countries**

Details	USA						BRA	FRA	JPN	IND	
	3M Co.	EDGAR Online, Inc.	General Electric Co.	Lockheed Martin Corp.	Microsoft Corp.	Qualcomm Inc.	United Technologies Inc.	Brazilian Petroleum Corp.	Business Objects S.A.	Hitachi Ltd.	Infosys Technologies Ltd.
Filing Date	11-15-2006	11-16-2006	11-16-2006	10-31-2006	11-14-2006	06-23-2006	12-06-2006	12-29-2006	08-09-2005	05-26-2005	08-29-2006
Form	8-K	8-K	8-K	8-K	8-K	8-K	8-K	6-K	10-Q	6-K	6-K
XBRL Instance Document Validation	OK	Error	OK	Error	OK	OK	OK	Error	Error	OK	OK
Company Taxonomy Extensions Validation	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Approved XBRL Taxonomies	Add-on Taxonomy	SEC Certification (usfr-seccert)					✓				
		Management Report (usfr-mr)									
		Accountants Report (usfr-ar)					✓				
		Management's Discussion & Analysis (usfr-md)			✓		✓				
Common Terms Taxonomy	Primary Terms Elements (usfr-pte)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Primary Terms Relationships (usfr-ptr)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Financial Service Terms Elements (usfr-fste)										
	Financial Service Terms Relationships (usfr-fstr)										

(continued on next page)

TABLE 1 (continued)

Details		USA						BRA	FRA	JPN	IND	
		3M Co.	EDGAR Online, Inc.	General Electric Co.	Lockheed Martin Corp.	Microsoft Corp.	Qualcomm Inc.	United Technologies Inc.	Brazilian Petroleum Corp.	Business Objects S.A.	Hitachi Ltd.	Infosys Technologies Ltd.
Industry Taxonomy	Commercial and Industrial (us-gaap-ci)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Banking and Savings Institutions (us-gaap-basi)											
	Insurance (us-gaap-ins)											
	Investment Management (us-gaap-im)											
Elements	Approved Taxonomy <sup>a</sup>	188	98	412	148	231	168	669	177	166	286	158
	Company's Taxonomy Extensions <sup>b</sup>	34	56	276	28	278	36	986	176	34	112	25
	Total <sup>c</sup>	222	154	688	176	509	204	1655	353	200	398	183
Contexts		8	10	18	10	56	6	155	8	10	9	9
Notes		✓		✓		✓		✓				
MD&A						✓		✓				
Accountant's Report								✓				
Accountant's Report on the XBRL-Related Documents								✓				
Total Lines in Instance Document		338	252	982	271	1339	287	4007	473	517	516	360

<sup>a</sup> The number of elements that are based on the approved XBRL taxonomies.

<sup>b</sup> The number of elements that are based on the company taxonomy extensions.

<sup>c</sup> The total number of elements that exclude "XML declaration," "namespace," "context," and "unit" sections.

into four major phases described by Hayes et al. (2005): client acceptance, planning, testing and evidence, and evaluation and reporting. Table 2 summarizes the procedures discussed in the PCAOB (2005) guidance with cross-references to the list of items discussed by the AWG (2006). The PCAOB (2005) guidance was intended for auditors engaged to report on whether the data contained in the XBRL-Related Documents accurately reflects the corresponding information shown in the official SEC filings. Since PWC's attestation engagement was based on this guidance, our mock assurance procedures on the XBRL-Related Documents of UTC's 10-Q were based on this same guidance.

### *Client Acceptance Phase*

The first phase is accepting an engagement. An auditor must decide whether he or she can and wishes to accept an assurance engagement. Also, the auditor should agree on the terms of engagement—including the objective and scope of the engagement, the responsibilities, and the form of the report—with the engaging party.

One of the issues that arise in this phase is the nature of the assurance engagement to be performed. Currently, there are several choices available, including audit/examination, review, and agreed-upon procedures. UTC could have requested agreed-upon procedures to be performed on its XBRL-Related Documents.<sup>10</sup> For example, PWC could have been asked to perform some specific tests to determine whether XBRL-Related Documents complied with certain specifications or requirements. Reports under this type of engagement usually have restricted distribution, and thus PWC's report would not be publicly available.

Instead, UTC requested and PWC performed an examination-level attestation engagement on the XBRL-Related Documents related to UTC's quarterly filing. Interestingly, PWC performed a review engagement on UTC's quarterly financial statements (as required for U.S. SEC registrants); however, it performed an examination-level attestation engagement on the XBRL-Related Documents. It is noteworthy that professional standards require knowledgeable reading of the MD&A to assess the consistency of the MD&A with the financial statements but this is not an attestation or assurance procedure. Therefore, an examination-level assurance engagement on the XBRL-Related Documents could exclude the MD&A, even though the information is contained in the same file.

To be able to accept the engagement to provide assurance on the XBRL-Related Documents, the auditor must have sufficient understanding and knowledge of both the engaging party and XBRL, including the process of instance document generation, custom taxonomy extension creation, and other elements of the filing process. Since detailed guidance on assurance-related issues such as materiality considerations in connection with identified exceptions in the XBRL-Related Documents is not widely available, the assurance team will need to have the competencies necessary to be able to exercise sound professional judgment in the circumstances. In most cases, the assurance team will have the required knowledge of the engaging party, but may need to avail itself of XBRL technical specialists to complete the engagement.

According to PCAOB (2005), an auditor accepting an engagement involving XBRL-Related Documents should not only have adequate knowledge of regulatory requirements, XBRL taxonomies, and XBRL specifications to perform the examination, but also have sufficient understanding of the company's financial statements and underlying financial records to evaluate the risk of misstatement in the XBRL-Related Documents. The PCAOB assumes that the auditor who is engaged to perform this examination has also audited, in

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<sup>10</sup> Note that under U.S. standards agreed-upon procedures are attestation/assurance engagements, whereas under international standards they are not.

**TABLE 2**  
**Comparison between AWG and PCAOB**

	<b>AWG</b>	<b>PCAOB</b>
<b>Client Acceptance</b>	Acceptance	Q4: Auditors' sufficient knowledge of the applicable SEC Regulations and XBRL taxonomies and specifications to perform the examination Q6: Auditor's independence in order to perform an attest engagement regarding XBRL-Related Documents
	Terms of Engagement	Q3: Primary engagement standards regarding XBRL-Related Documents Q7: Objectives and examination procedures regarding the XBRL-Related Documents
<b>Planning</b>	Planning the Engagement: Understanding the Subject Matter	Q3: Primary engagement standards regarding XBRL-Related Documents Q4: Auditors' sufficient knowledge of the applicable SEC Regulations and XBRL taxonomies and specifications to perform the examination
	Assessing the Appropriateness of the Subject Matter	Q5: The attributes of suitable and available criteria for examination engagements regarding XBRL-Related Documents
	Assessing the Suitability of the Criteria	Q5: The attributes of suitable and available criteria for examination engagements regarding XBRL-Related Documents
	Risk and Materiality	
<b>Testing and Evidence Gathering</b>	Obtaining Evidence	Q7: Objectives and examination procedures regarding the XBRL-Related Documents
	Using the Work of an Expert	
	Management Representations	Q7: Objectives and examination procedures regarding the XBRL-Related Documents
<b>Evaluation and Reporting</b>	Reporting	Q8: Reporting requirements for examination engagements regarding XBRL-Related Documents
		Q1: General information about XBRL Q2: Information about the XBRL Voluntary Financial Reporting Program on the EDGAR System

accordance with PCAOB standards, the financial statements for at least the latest period to which the XBRL financial information relates.

We assume that the assurance engagement performed by PWC was conducted with professional competency and in accordance with PCAOB guidelines. In our study of the UTC case, we obtained the background knowledge that we needed through extensive analysis of UTC's SEC filings and interviews with UTC personnel.

### ***Planning Phase***

In the planning phase, the auditor determines the amount and type of evidence required to allow a conclusion whether the subject matter is presented fairly. In order to do so, the auditor obtains an understanding of the subject matter and other engagement circumstances. In addition, the suitability of the subject matter is assessed by investigating whether the subject matter is identifiable and capable of consistent evaluation and measurement against the identified criteria. The appropriateness of the identified criteria is also determined. In an XBRL assurance context, the auditor would be assessing the accuracy and completeness<sup>11</sup> of the translation of the paper paradigm financial statements into XBRL rather than assessing the fairness of presentation. An interesting aspect of providing assurance on XBRL-Related Documents is that the criteria used for this purpose include not only the XBRL specifications and approved (or official) XBRL taxonomies but also companies' extensions to approved XBRL taxonomies. It may seem somewhat circular to use the company's taxonomy extensions as the basis for assessing the completeness and accuracy of the company's instance document; however, this is consistent with the guidance recommended by the PCAOB, provided that the quality or appropriateness of the company's taxonomy extensions has been evaluated. This step can be problematic as there is limited guidance for practitioners on how to evaluate the appropriateness of the company's taxonomy extensions. In addition, as in the traditional audit, the engagement risk and materiality are assessed to determine the likelihood of a material misstatement of the subject matter. This can also be problematic because there is no guidance on what constitutes a material misstatement of the subject matter.

The subject matter of the XBRL engagement in this paper is the XBRL-Related Documents related to UTC's Q3 2005 10-Q filing (henceforth, 10-Q XBRL-Related Documents). We initially concluded that the 10-Q XBRL-Related Documents are an appropriate subject matter because the XBRL-Related Documents are identifiable and capable of consistent evaluation against suitable criteria such as XBRL Specification v2.1 and regulatory requirements. We subsequently found that the XBRL-Related Documents also contained sections such as the MD&A for which there are no meaningful assurance criteria.<sup>12</sup> The primary focus of our examination procedures was to determine whether the elements in the XBRL-Related Documents of UTC's 10-Q are the same as the financial facts in UTC's paper paradigm 10-Q and whether the appropriate taxonomies are used for mapping the facts in the financial statements, notes, and MD&A to XBRL elements.

We then assessed the suitability of the identified criteria to evaluate the 10-Q XBRL-Related Documents. According to the PCAOB (2005), XBRL Specification v2.1, the approved XBRL taxonomy for U.S. companies, and appropriate stand-alone add-on taxonomies would be considered as suitable criteria. The appropriateness of the company's extensions to approved taxonomies must be evaluated because those extensions are not developed by following the formal taxonomy recognition process of XBRL International

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<sup>11</sup> Note that PCAOB (2005) only refers to accuracy, whereas AWG (2006) refers to completeness and accuracy. However, the procedures listed in PCAOB (2005) include procedures aimed at testing completeness; thus, there does not appear to be any substantive difference between the assertions that would be tested under PCAOB (2005) and AWG (2006).

<sup>12</sup> AICPA AT Section 700 establishes attestation standards for MD&A; however, the XBRL taxonomy for MD&A is not addressed in these standards, and the existing XBRL taxonomy is very limited, offering no meaningful criteria for an assurance provider to use in assessing a client's MD&A. The AICPA's SAS No. 8 is intended for paper paradigm MD&A that accompanies paper paradigm financial statements, and may not provide the required guidance for electronic documents such as MD&A coded in XBRL accompanying financial statements coded in XBRL.



(XBRL International 2004). The 10-Q XBRL-Related Documents were examined by mapping the information in UTC's 10-Q to elements in the approved XBRL taxonomies as well as UTC's taxonomy extensions (hereafter, UTC taxonomy) as summarized in Table 3. Table 3 indicates that there were 573 extension elements compared to 570 standard elements in UTC's taxonomy. By far the largest number of extensions related to the notes (346) and MD&A (96), although there were also 16 extensions to the Financial Statements. Assessing the suitability of a taxonomy with so many extensions is a difficult task, as is explained in the next section.

### ***Testing and Evidence Gathering Phase***

In the third phase, testing and evidence gathering, the auditor gathers sufficient appropriate evidence to enable him or her to draw a conclusion whether the subject matter is presented completely and accurately, in all material aspects. According to PCAOB (2005), the objectives of examination procedures regarding XBRL-Related Documents are to assess whether the XBRL-Related Documents reflect the same information as the corresponding official SEC filings. Normally, procedures are conducted during this phase to determine: (1) whether the XBRL instance document complies with XBRL specifications and approved XBRL taxonomies, (2) whether the company taxonomy extensions are consistent with applicable regulatory requirements and XBRL specifications, and (3) whether the elements in the XBRL instance document completely and accurately reflect the business facts in the original document. In some cases, the auditor needs to rely on XBRL technical experts during the evidence gathering process. It is also important to obtain representations from the responsible party.

We performed three examination procedures. First, we obtained UTC's 10-Q and the 10-Q XBRL-Related Documents from EDGAR.<sup>13</sup> Then, we examined whether the UTC taxonomy, the company extension of the approved XBRL taxonomy, is a suitable taxonomy. We assessed UTC's taxonomy's compliance with XBRL Specification v2.1 by using Fujitsu's Taxonomy Editor (Version 42) and DecisionSoft's True North Personal Validator 2006 (Version 2.3.3). The "Validate Taxonomy" function of both tools indicated that it is a valid taxonomy. A valid taxonomy extension may nevertheless not be suitable if it contains elements that are already contained in the official taxonomy. We noticed examples of extension elements being used instead of approved XBRL taxonomy elements that were available. For example, "Accountants Report Information—Title of Report" (<ReportInformationTitleReport>) in the UTC taxonomy can be found in U.S. Financial Reporting—Accountants Report (usfr-ar) taxonomy, "Title of Accountants Report" (<TitleReport>). Similarly, "Accountants Information—Name" (<Accountants-InformationName>) in the UTC taxonomy is identical with "Accountant Name" (<AccountantName>) in "usfr-ar" taxonomy. We did not see a reason for these seemingly unnecessary taxonomy extensions.

When assessing the suitability of the taxonomy, it is also important to examine the underlying authority of each element in the taxonomies (e.g., accounting standards). Such information is represented in the reference linkbase (AWG 2006). Some taxonomies, such as the U.S. GAAP and IFRS taxonomies, are produced by authoritative bodies, and

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<sup>13</sup> The 10-Q is available at: <http://www.sec.gov/Archives/edgar/data/101829/000119312505206040/0001193125-05-206040-index.htm>. The XBRL-Related Documents of UTC's 10-Q and the auditor's report are available at: <http://www.sec.gov/Archives/edgar/data/101829/000119312505247623/0001193125-05-247623-index.htm>.

**TABLE 3**  
**Analysis of UTC's 12-22-2005 XBRL Filing**

	<u>Approved Taxonomy<sup>a</sup></u>	<u>Taxonomy Extensions<sup>b</sup></u>
Part I: Financial Information		
Financial Statements	182	16
Notes to Condensed Consolidated Financial Statements	198	346
Report of Independent Registered Public Accounting Firm	0	12
Management's Discussion and Analysis of Financial Condition and Results of Operations	160	96
Quantitative and Qualitative Disclosures About Market Risk	1	0
Controls and Procedures	1	1
Part II: Other Information		
Legal Proceedings	0	1
Unregistered Sales of Equity Securities and Use of Proceeds	0	16
Exhibits	0	21
Signatures	0	13
Exhibit 12: Computation of Ratio of Earnings to Fixed Charges	4	16
Exhibit 15: Unaudited Interim Financial Information	0	13
Exhibit 31.1: Rule 13a-14(A)/15d-14(A) Certification	8	3
Exhibit 31.2: Rule 13a-14(A)/15d-14(A) Certification	8	3
Exhibit 31.3: Rule 13a-14(A)/15d-14(A) Certification	8	3
Exhibit 32: Section 1350 Certifications	<u>0</u>	<u>13</u>
Total	570	573
Approved XBRL Taxonomies used for Instance Document	Commercial and Industrial (us-gaap-ci)	
	Primary Terms Elements (usfr-pte)	
	Primary Terms Relationships (usfr-ptr)	
	SEC Certification (usfr-seccert)	
	Management's Discussion & Analysis (usfr-md)	
Contexts		145
Elements	Approved Taxonomy <sup>c</sup>	397 (45.3%)
	Company's Taxonomy Extensions <sup>c</sup>	480 (54.7%)
	Total <sup>d</sup>	877 (100.0%)
Total Lines in Instance Document		2742

<sup>a</sup> The number of elements that are based on the approved XBRL taxonomies.

<sup>b</sup> The number of elements that are based on the company's taxonomy extensions.

<sup>c</sup> The element numbers (i.e., 397 and 480) differ from the above numbers (i.e., 570 and 573) because some of the elements (e.g., signatures and total assets) are used more than once in the instance document.

<sup>d</sup> The total number of elements that exclude "XML declaration," "namespace," "context," and "unit" sections.

the auditor could use them without further assessment. However, company extensions to authoritative taxonomies must be assessed as to their appropriateness. To assess whether the UTC taxonomy was in conformity with applicable regulatory requirements, we examined the reference linkbase of the UTC taxonomy. Most elements in UTC's taxonomy extensions did not have reference links. However, it was not clear to us how we or an auditor would determine the impact of missing reference links on the auditor's assessment of the appropriateness of the taxonomy extensions because there is no standard or guidance with respect to this matter.<sup>14</sup> Presumably, some evidence could come from enquiry and discussions with management and prior audit knowledge that the auditor would possess. The limited use of references in the UTC taxonomy is an example of the differences that can exist between acceptable practices and best practices.

Next, we examined whether the instance document is a valid document that complies with XBRL Specification v2.1 using Fujitsu's Instance Creator (Version 42) and DecisionSoft's True North Personal Validator 2006 (Version 2.3.3). The "Validate Instance" function of both tools indicated that it is a valid instance document. We also performed a calculation check according to the calculation link in both the approved XBRL taxonomies and the UTC taxonomy. The calculation check using the "Calculation Check" function of both tools completed with no errors.

Finally, we assessed whether the 10-Q XBRL-Related Documents are an accurate reflection of the business facts stated in UTC's 10-Q. Since we could not rely on detailed knowledge of the process used by UTC, which might have led us to use a different (e.g., controls-based) approach, we performed a 100 percent substantive examination consisting of two-way tracing.

The two-way tracing was performed in three steps. We first examined the contexts. For instance, "Context95" describes the information about a business fact captured as XBRL elements in the instance document of 10-Q. It represents the entity being described (i.e., the Carrier segment of UTC), the reporting period (i.e., between 2005-04-01 and 2005-06-30), and the reporting scenario (i.e., Restructuring Action in 2004). Since the contexts in the instance document were not organized in any particular patterns, we listed and analyzed the contexts using a spreadsheet. That is, we identified each context in the instance document and entered the identified information into Excel. Then, all 145 contexts were sorted by Context ID and by Segment and used in the two-way tracing.<sup>15</sup> Although there is no requirement that contexts or, for that matter, any portion of the XBRL document be organized to facilitate management and auditor review, we found that the haphazard organization of the contexts made this part of our examination very time-consuming. When we discussed this issue with UTC personnel, we learned that they too were hampered by the lack of organization. They explained that this was a weakness of the XBRL software that they had adopted which did not permit the use of explanatory labels for the contexts and did not provide for orderly numbering and organization of the instance document to facilitate review.<sup>16</sup>

Second, we traced each business fact in UTC's 10-Q to an element in the instance document. For example, Figure 2 shows a part of UTC's condensed consolidated balance

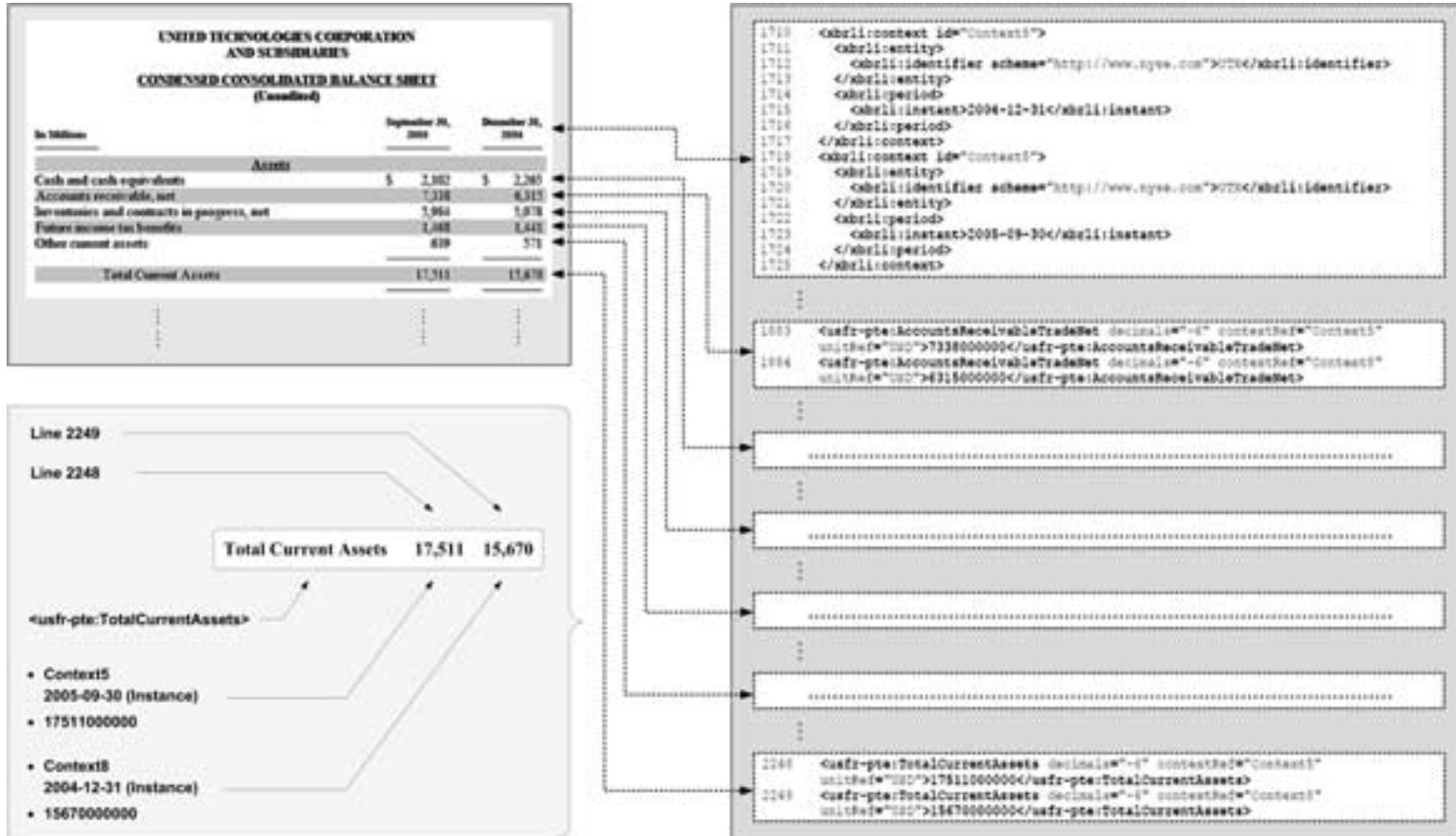
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<sup>14</sup> References are not a requirement of the SEC's VFP or the PCAOB Q&A. Financial Reporting Taxonomies Architecture (FRTA) requires only a good definition or a reference.

<sup>15</sup> An alternative to this approach would be to develop a stylesheet to identify and organize all the contexts. However, doing so would have been more time-consuming than the manual approach we took unless the stylesheet could be reused over several periods.

<sup>16</sup> In 2006, UTC switched to another XBRL software product that not only enabled it to easily reorganize and revise contexts but also cut the time required to complete the translation process.

FIGURE 2  
Manuel Two-Way Matching Process of Financial Items



sheet. We began by examining contexts that represented both September 30, 2005, and December 31, 2004. By examining the spreadsheet, we identified Context5 (2005-09-30) and Context8 (2004-12-31). We next searched for the dollar amounts in the instance document. For instance, the total current assets for September 30, 2005, and December 31, 2004, in UTC's condensed consolidated balance sheet were \$17,511,000 and \$15,670,000, respectively. Using the search function of a text editor (i.e., WordPad), we pinpointed the lines in the instance document that contained 17511000 and 15670000 (i.e., lines 2248 and 2249) and examined whether the context (i.e., reporting period), unit (i.e., USD), and element (i.e., usfr-pte:TotalCurrentAssets) corresponded to the business fact (i.e., total current assets). Notes and MD&A were investigated in a similar way. That is, a phrase or sentence in a note or MD&A section was looked up using the search function of the text editor. Then, the context and content were examined.

Finally, we verified the previous steps through reverse tracing; that is, we located the corresponding fact for each element of the instance document in UTC's original 10-Q filing. The findings of this two-way tracing are discussed in the section headed Findings.

### ***Evaluation and Reporting Phase***

In the final phase, evaluation and reporting, the auditor evaluates the evidence and prepares a report regarding the XBRL engagement as distinct from the accountant's report on the paper paradigm financial statements. Figure 3 illustrates the form of reporting recommended by the PCAOB (2005) and used by PWC in connection with its report on UTC's XBRL filings. Other forms of reporting would also be possible, depending on the nature of the engagement, as previously discussed.

Based on the evidence obtained through our examination procedures, we evaluated the 10-Q XBRL-Related Documents and the report on the 10-Q XBRL-Related Documents prepared by PWC. In particular, we evaluated whether PWC's report was consistent with the PCAOB's recommendation. Our findings are provided in the next section.

## **IV. FINDINGS**

Our mock assurance procedures on UTC's 10-Q XBRL-Related Documents (i.e., instance documents and taxonomies) took an XBRL expert (one of the co-authors) about 63 hours to complete. At the end of the process, we had high assurance that the 10-Q XBRL-Related Documents were a *complete* and *accurate* reflection of UTC's 10-Q. However, if we had to form a conclusion on the *fairness* of the presentation in accordance with GAAP of the XBRL-Related Documents, we would be unable to do so because there are no assurance standards or guidelines for making such an assessment for various sections such as the MD&A, regulatory information, and the company's taxonomy extensions. In this section, we summarize our findings under the following headings: taxonomy extensions, instance document, notes and MD&A, accountant's report on the financial statements, and accountant's report on the XBRL engagement.

### **Taxonomy Extensions**

Initially, we were surprised to find that only 45.3 percent of the instance document of 10-Q was based on approved standard taxonomies, including the industry taxonomy (U.S. GAAP Commercial and Industrial: us-gaap-ci), common terms taxonomy (Primary Terms Elements: usfr-pte, and Primary Terms Relationships: usfr-ptr), and add-on taxonomies (SEC Certification: usfr-seccert, and MD&A: usfr-md), with the rest being based on UTC's taxonomy extensions (see Table 3). However, when we examined other filings (see Table 1), we found that use of taxonomy extensions was common, and it was most extensive for



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**FIGURE 3**  
**An Accountant's Report Regarding XBRL Engagement**

**Report of Independent Registered Public Accounting Firm**

To the Board of Directors and Shareowners of United Technologies Corporation:

We have examined the accompanying XBRL-Related Documents of United Technologies Corporation (the "Corporation"), presented as Exhibit 100 to the Corporation's Current Report on Form 8-K, which reflect the data presented in the Corporation's Quarterly Report on Form 10-Q for the quarter and nine-months ended September 30, 2005. The Corporation's management is responsible for the XBRL-Related Documents. Our responsibility is to express an opinion based on our examination.

We have also reviewed, in accordance with the standards of the Public Company Accounting Oversight Board (United States), the financial statements of the Corporation as of September 30, 2005, and for the three and nine-month periods then ended, the objective of which was the expression of limited assurance on such financial statements, and issued our report thereon dated October 21, 2005. A review of financial statements is substantially less in scope than an audit conducted in accordance with the standards of the Public Company Accounting Oversight Board (United States), the objective of which is the expression of an opinion regarding the financial statements taken as a whole. Accordingly, we do not express such an opinion.

In addition, we have previously audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), the consolidated balance sheet as of December 31, 2004, and the related consolidated statements of operations, of cash flows and of changes in shareowners' equity for the year then ended, management's assessment of the effectiveness of the Corporation's internal control over financial reporting as of December 31, 2004 and the effectiveness of the Corporation's internal control over financial reporting as of December 31, 2004, and in our report dated February 10, 2005, except for Notes 1, 10 and 16 for which the date is May 6, 2005, we expressed unqualified opinions thereon. We were not engaged to and did not conduct a review of the information contained in Part I, Items 2, 3 and 4 and Part II, Items 1, 2 and 6 of the Corporation's Quarterly Report on Form 10-Q for the quarter and nine-months ended September 30, 2005, the objective of which would have been the expression of limited assurance on such aforementioned information. Accordingly, we do not express an opinion or any other assurance on such aforementioned information.

Our examination of the XBRL-Related Documents was conducted in accordance with the standards of the Public Company Accounting Oversight Board (United States) and, accordingly, included examining, on a test basis, evidence supporting the XBRL-Related Documents. Our examination also included evaluating the XBRL-Related Documents for conformity with the applicable XBRL taxonomies and specifications and the content and format requirements of the Securities and Exchange Commission. We believe that our examination provides a reasonable basis for our opinion.

In our opinion, the XBRL-Related Documents of United Technologies Corporation referred to above accurately reflect, in all material respects, the data presented in the Corporation's Quarterly Report on Form 10-Q for the quarter and nine-months ended September 30, 2005, in conformity with the US GAAP—Commercial and Industrial Taxonomy, US Financial Reporting—Management's Discussion and Analysis Taxonomy, US Financial Reporting—Accountant's Report Taxonomy, US Financial Reporting—SEC Certifications Taxonomy, extensions specific to United Technologies Corporation (as included in Exhibit EX-100.SCH and EX-100.SCH-1), and the XBRL Specifications (Version 2.1).

/s/ PRICEWATERHOUSECOOPERS LLP

Hartford, CT  
December 22, 2005

companies that provided not just financial statements, but notes and MD&A. Discussions with UTC personnel indicated that the extensions were necessary due to the limitations of the standard taxonomies. One result of such extensions can be reduced comparability between companies, although it can also be argued that extension taxonomies can improve comparability by enabling a company to avoid using inappropriate elements in a standard taxonomy that does not contain sufficient elements to enable the company to choose standard elements that best reflect the company's business facts. This concern goes beyond the current PCAOB requirement of assuring that the XBRL-Related Documents accurately reflect the company's paper paradigm filing, and relates to the potential usefulness of XBRL filings and to whether they represent best practices. Based on the fact that PWC expressed a clean opinion on the XBRL-Related Documents, we have some comfort that most of the extensions were necessary and reasonable. However, as mentioned previously and discussed below under the heading *Accountant's Report*, we could not see why a custom taxonomy was used instead of an approved XBRL taxonomy that was available.

In addition, we found 12 redundant elements in the UTC taxonomy. It used different elements for the same names, signatures, job titles, and date contained in different exhibits. The elements used to describe James E. Geisler and Gregory J. Hayes in the signature section of UTC's 10-Q were not used in the Section 1350 certifications. Instead, different taxonomy elements were used. Upon discussion with UTC personnel, we learned that they decided to use different tags for the same name and signature used in connection with a different certificate.

### Instance Document

We were initially surprised to see that the instance document of UTC's 10-Q contained 145 contexts (see Table 3). They were not in any logical order that we could see. Even though we listed and analyzed the contexts using a spreadsheet to determine whether there were particular patterns, we could not identify any logical patterns. Apart from the difficulties in understanding and tracing created by this lack of organization, it can cause problems in subsequent periods to determine inter-period consistency if contexts do not follow any specified sequence or pattern (e.g., quarter to quarter). We compared UTC's use of contexts with the next most extensive contemporaneous filing which was Microsoft Inc. (MSFT: 2005-11-29 filing). UTC had 145 contexts compared to MSFT's 66. Our analysis of the contexts indicated that the large number of contexts was primarily associated with the more detailed tagging of notes by UTC, which had 133 tags compared to MSFT's 23. Upon reflection, we concluded that the difficulty we had was not due to the large number of contexts *per se* but due to their naming, numbering, and location in the instance document.

There was an issue with respect to labels in the instance document. Although numbers and notes could be traced, titles and subtitles were not always presented in the instance document in a consistent manner, or were missing altogether.<sup>17</sup> This is the case in both the primary financial statements section and MD&A. Labels were also missing or not exactly the same in the label linkbase as in the taxonomy. For instance, the condensed consolidated statement of operations on page three of the 10-Q showed that "Income before income taxes and minority interests" for 2004 and 2005 were \$1,041 and \$1,249, respectively.

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<sup>17</sup> It is a judgment issue whether titles and subtitles are presentation or fact. Presentation material is not supposed to be placed in the instance document.

However, the actual label in the label linkbase of usfr-pte (U.S. Financial Reporting: Primary Terms—Elements) taxonomy was “Income/(Loss) from Continuing Operations Before Income Taxes.” It is a matter of some debate whether labels in the label linkbase should be exactly the same as those in the taxonomy, and if differences are acceptable, how an auditor would determine whether a user of the XBRL document would be misled by a label change.

In addition, six subtotals which appeared in the notes in the 10-Q and two subtotals in Exhibit 12 were omitted in the instance document. Although the totals could be recalculated using the calculation linkbase, the use of totals was not consistent. Sometimes they were in the instance document, and sometimes they were left as implicit items defined in the calculation linkbase. For instance, in Note 1 on page nine of the 10-Q, there was a total for the intangible assets in the “Identifiable Intangible Assets” table, but not in the instance document. Also, in Note 3 on page ten, there were totals for inventories for 2004 and 2005 in the “Inventories and Contracts in Progress” table and in the instance document using UTC’s taxonomy extension element (i.e., <InventoriesGross>). However, a total for net periodic benefit costs in Note 6 on page 12 was given in the “Pension and Postretirement Plans” table, but not in the instance document.

### Notes and MD&A

We found a disaggregation of textual narratives in both the notes and MD&A. Note 11 on page 17 of the 10-Q was shown as a single section. However, in the instance document, it consisted of four separate elements that were spread throughout the instance document. They were not close to each other and not in sequence. In addition, tables that went with notes were not together with the text and always omitted labels that appeared in the original 10-Q.

### Accountant’s Report

As mentioned previously, UTC used its taxonomy extensions for the “Report of Independent Registered Public Accounting Firm” instead of using the usfr-ar (U.S. Financial Reporting: Accountants Report) taxonomy. All elements in the UTC taxonomy are in the usfr-ar taxonomy, so there is no obvious deficiency that UTC was attempting to address by using its taxonomy extensions here. Since the usfr-ar taxonomy is an approved taxonomy developed by following the taxonomy recognition process of XBRL International, it would seem to be a more appropriate taxonomy than a company taxonomy extension.<sup>18</sup> Furthermore, the use of extension taxonomies can threaten the comparability of the XBRL-Related Documents.

### Accountant’s Report Regarding XBRL Engagement

PWC performed an attestation engagement on the 10-Q XBRL-Related Documents. Our comparison of the PCAOB’s recommended report against PWC’s report presented in Figure 3 indicates that, in addition to meeting PCAOB requirements, all necessary elements were satisfactorily addressed in PWC’s report.<sup>19</sup>

According to PCAOB (2005), a report is referred to as an audit report if the underlying information in the XBRL-Related Documents has been audited. On the other hand, a report

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<sup>18</sup> While the 2005-12-22 filing used UTC’s taxonomy extensions, the 2006-12-06 filing used the approved XBRL taxonomy (i.e., usfr-ar).

<sup>19</sup> Interestingly, the accountant’s opinion on the instance document was created in HTML format rather than XBRL and was filed as a separate document.

is referred to as a review report if the underlying information was reviewed and the report was filed with the SEC. However, a report is not referred to as a review report when the underlying information was reviewed, but the review report was not filed with the SEC. In this case, the PCAOB suggests that auditors indicate that the underlying information has not been audited and that they do not express opinion in the report. If the XBRL-Related Documents were not covered by an audit report or review report, auditors are advised to disclaim an opinion on any underlying information in the XBRL-Related Documents.

Since the review report prepared by PWC was not filed with the SEC, PWC stated that the underlying information in the 10-Q XBRL-Related Documents has not been audited and did not express an opinion on that information in the report. It is noteworthy that PWC's opinion addresses the financial statements, MD&A, and SEC certifications, and that one of the criteria against which the assessment was made is "extensions specific to United Technologies Corporation (as included in Exhibit EX-100.SCH and EX-100.SCH-1)." As mentioned previously, before the company's taxonomy extensions can be used as criteria, their appropriateness should be assessed. In this case, we have already noted that more than half of the elements used in the instance document of 10-Q were the company's taxonomy extensions, and some of those extensions seemed unnecessary to us (i.e., 19 elements in accountant's report and 12 elements in various exhibits). However, as we do not have the same knowledge of the circumstances as PWC would have, we must defer to PWC's judgment that the company's extensions were appropriate.

## V. EXTENDED ANALYSIS

### Subsequent-Period Engagement

If the procedures described in this paper could be repeated in subsequent periods with the same personnel from the previous period's engagement, they would probably take less time to complete. Even if they initially performed a 100 percent examination, auditors could use sampling in subsequent assurance engagements. As in a traditional audit context, either statistical sampling or nonstatistical sampling could be used to obtain such a sample. When designing the size and structure of an audit sample, the auditor should consider audit risk associated with the specific audit objective (e.g., XBRL-Related Documents accurately and completely reflect the corresponding information in the official filings) as well as the materiality level. At present, however, it would be difficult for auditors to define what constitutes material errors and audit risk (i.e., inherent risk, control risk, and detection risk) due to the lack of guidance.

In addition, an auditor who performs a subsequent assurance engagement would need to determine whether the XBRL-Related Documents are prepared in a manner consistent with prior periods. One of the main goals of adopting XBRL is to make it easier and more efficient for investors and analysts to search and analyze financial data across multiple reporting periods. To achieve this goal, it is important that the XBRL-Related Documents are properly managed to ensure consistency. That is, the same rules and taxonomies, unless otherwise indicated, should be applied to create the XBRL-Related Documents across reporting periods, especially quarter to quarter. Therefore, the auditor should also assess whether there is consistent use of official and extension taxonomies across reporting periods and whether the same rules are applied to create context information for the XBRL-Related Documents of different reporting periods.

### Impact of New (2008) Taxonomy

On April 28, 2008, XBRL-U.S. released a new taxonomy (i.e., U.S. GAAP Taxonomies 1.0) including a preparer's guide, sample financial statements in XBRL format, technical

information about the taxonomies, and case studies. The new U.S. GAAP taxonomy was developed to cover a broad range of financial reporting concepts including all U.S. GAAP and SEC financial statement disclosure requirements, as well as commonly followed reporting practices. Hence, the number of elements included in the new taxonomy was dramatically increased compared to the previous taxonomy (i.e., U.S. GAAP 2005, Version 6). For instance, the number of elements in the U.S. GAAP—Commercial and Industrial taxonomy increased from 1,503 to 12,126. Table 4 provides a comparison between the two taxonomies.

It is expected that there will be far fewer company taxonomy extensions with the new taxonomy, and this may increase the quality of XBRL filings and reduce the time required to provide assurance since there would be less taxonomy extensions to evaluate. Since our case study was based on UTC's 2005-12-22 filing, which was created based on the previous taxonomy, we analyzed UTC's 2008-10-21 filing that used the new taxonomy to gauge the potential impact of the new taxonomy on assurance effort. Since UTC's 2008-10-21 filing did not include notes and MD&A, we also analyzed Microsoft's filing for the corresponding period (MSFT: 2008-10-23 filing). Table 5 contains a comparative analysis of XBRL filings of UTC and MSFT for 2005 and 2008.

As expected, there were fewer taxonomy extensions in the filings based on the new taxonomy. For example, the use of extension elements in UTC's financial statements decreased from 8.1 percent to 2.1 percent, while MSFT's use of taxonomy extensions in its financial statements dropped from 20.6 percent to 10.3 percent. Similarly, in MSFT's filing,

**TABLE 4**  
**Comparison between U.S. GAAP 2005-6 Version and U.S. GAAP Taxonomies 1.0**

	<b>U.S. GAAP 2005-6 Version (02-28-2005)</b>	<b>U.S. GAAP Taxonomies 1.0 (03-31-2008)</b>
<b>U.S. GAAP Taxonomies</b>		
Banking and Savings Institutions	384	—
Brokers and Dealers	—	—
Commercial and Industrial	1,503	—
Insurance Entities	2,384	12,126 <sup>a</sup>
Real Estate	—	—
<b>Non-GAAP Taxonomies</b>		
Accountants Report	33	43
Document and Entity Information	—	135
Country Codes	—	255
Currency Codes	—	172
Exchange Codes	—	535
State or Province Codes	—	65
SIC Codes	—	459
NAICS Codes	—	1,196
Management Report	15	18
Management Discussion and Analysis	66	69
SEC Certification	54	58

<sup>a</sup> U.S. GAAP Taxonomy (11,991) + Document and Entity Information taxonomy (135). All elements in the new U.S. GAAP taxonomy are contained in a base taxonomy (i.e., us-gaap-2008-03-31.xsd). A preparer of an XBRL instance document is required to use one of five industry entry points (i.e., Banking and Savings Institutions, Brokers and Dealers, Commercial and Industrial, Insurance, and Real Estate) that most closely reflects the content and organization of the financial statements.



**TABLE 5**  
**Comparative Analysis of XBRL Filings Using Old and New Taxonomies**

XBRL Filing	United Technologies Corporation				Microsoft Corporation			
	12-22-2005 (Old Taxonomy)		10-21-2008 (New Taxonomy)		11-29-2005 (Old Taxonomy)		10-23-2008 (New Taxonomy)	
	Official <sup>a</sup>	Extension <sup>b</sup>	Official	Extension	Official	Extension	Official	Extension
Financial Statements	182 (91.9%)	16 (8.1%)	186 (97.9%)	4 (2.1%)	143 (79.4%)	37 (20.6%)	174 (89.7%)	20 (10.3%)
Notes	198 (36.4%)	346 (63.6%)	—	—	89 (63.1%)	52 (36.9%)	201 (73.4%)	73 (26.6%)
MD&A	162 (52.3%)	148 (47.7%)	—	—	49 (25.1%)	146 (74.9%)	63 (42.9%)	84 (57.1%)
Other <sup>c</sup>	28 (30.8%)	63 (69.2%)	—	—	—	—	—	—
Total	570 (49.9%)	573 (50.1%)	186 (97.9%)	4 (2.1%)	281 (54.5%)	235 (45.5%)	438 (71.2%)	177 (28.8%)
Contexts		145		8		66		119
Taxonomy Validation		OK		OK		OK		OK
Instance Validation		OK		OK		OK		Error <sup>d</sup>

<sup>a</sup> Number of official elements used in the XBRL filing.

<sup>b</sup> Number of extension elements used in the XBRL filing.

<sup>c</sup> Accountant's report and SEC certification.

<sup>d</sup> The errors (i.e., calculation errors) represent inconsistencies between the XBRL instance document and suggested, but not mandatory, practices. For example, subtotals that are in the taxonomy but not in the instance document were flagged as calculation errors.

the use of extension elements in notes and MD&A decreased from 36.9 percent to 26.6 percent and from 74.9 percent to 57.1 percent, respectively. This indicates that the use of taxonomy extensions in notes and MD&A is still very pronounced.

In terms of contexts, UTC used 145 contexts in the 2005-12-22 filing, but only eight contexts in the 2008-10-21 filing. This is partly due to the fact that the latter filing did not include notes and MD&A. Six contexts were used for basic financial statements in the 2005-12-22 filing while eight contexts were used in the 2008-10-21 filing. In contrast with the contexts in the 2005-12-22 filing, the contexts in the 2008-10-21 filing were logically organized. For instance, the context IDs used in the 2008-10-21 filing were descriptive enough to identify the period and other distinguishing aspects of the context (e.g., QTD\_Sep30\_2008 versus Context9). As a result, it was much easier to understand and took less time to conduct the mock assurance procedures on this set of XBRL-Related Documents.

With respect to the validation results, all four XBRL filings passed the taxonomy validation test without any errors or exceptions. However, MSFT's 2008-10-23 XBRL filing did not pass the instance document validation test, showing several errors. The errors were calculation errors which represent inconsistencies between the XBRL instance document and suggested, but not mandatory, practices. For example, subtotals that are in the taxonomy but not in the instance document were flagged by the software as calculation errors. We believe that most users would view this as a legitimate reporting choice and not an error. Nevertheless, it took us approximately two hours to investigate each error to assess its significance.

We also reperformed two-way tracing procedures aimed at determining whether the XBRL-Related Documents were a complete and accurate reflection of the official filing. For UTC's 2005-12-22 filing, it had taken about 16 hours to complete the examination of the financial statements, but it only took approximately 12 hours for UTC's 2008-10-21 filing. Part of this reduction was due to the efficiency gained from performing a repeat engagement and part was due to the reduced number of extensions that needed to be assessed. Although we were not able to directly compare the hours required to complete the examination of notes and MD&A between the two UTC filings because UTC's 2008-10-21 filing did not include notes and MD&A, we expect that it would also take less time to complete the examination of notes and MD&A; however, the reduction would not be as great due to large number of taxonomy extensions still used for notes and MD&A, even with the new taxonomy.

In summary, the increased number of elements included in the new taxonomy will significantly reduce the use of extensions, which should also enhance the quality of XBRL-Related Documents and reduce the time to conduct the assurance engagement. However, a large proportion of XBRL elements used for notes and MD&A still use taxonomy extensions. This will add to the time and cost when an auditor conducts an assurance engagement on XBRL-Related Documents.

## VI. LIMITATIONS AND FUTURE RESEARCH

The main purpose of this study was to perform and learn from some of the procedures that an auditor might perform to support an opinion on an organization's XBRL-Related Documents if the auditor were to provide assurance that those XBRL-Related Documents were an accurate reflection of the organization's regulatory paper paradigm filing. Following the steps recommended by the PCAOB, we performed mock assurance procedures on the XBRL-Related Documents of UTC's 10-Q filed on EDGAR on December 22, 2005. Our examination involved validation tests, 100 percent two-way tracing of the information contained in the XBRL-Related Documents and the paper paradigm filing, as well as other

procedures. In addition, we discussed our preliminary findings with the preparers of the XBRL-Related Documents and auditors and obtained explanations for matters that came to our attention.

We recognize that auditors could have other options than performing a 100 percent substantive examination in circumstances such as these. In many cases, auditors would have sufficient knowledge of the company's financial statements, financial records, and the process used to create the XBRL filing to understand and be able to assess the XBRL-Related Documents by considering less than a 100 percent reperformance of the translation from paper paradigm to XBRL format. Also, computer-assisted auditing tools designed for analyzing XBRL documents could make this process much less tedious and time-consuming, but these tools do not currently exist. White (2007) describes the use of Extensible Stylesheet Language Transformations (XSLT) to perform certain audit tasks. Bovee et al. (2005) developed Financial Reporting and Auditing Agent with Net Knowledge (FRAANK)<sup>20</sup> that can help auditors when they perform various analytical procedures. Boritz and No (2009) describe the use of a research prototype of an XBRL rendering tool to support various audit tasks on XBRL-Related Documents. Until such tools are widely available for use in assurance engagements, auditors must rely on a combination of text editing software, spreadsheets, XBRL document creation software, and manual procedures to perform necessary procedures.

A limitation of our approach is that we performed our procedures after PWC had already rendered their opinion on the XBRL-Related Documents. Thus, PWC's assurance process had already identified and corrected some errors and omissions in UTC's initial version of the XBRL-Related Documents. This was confirmed by our interview of UTC personnel. As a result, the documents that we examined were more accurate than the typical filing under the VFP and our findings probably understate the difficulties and issues that warrant consideration.

We offer several suggestions for future research. First, as we addressed in this paper, companies' limited experience with the creation of XBRL-Related Documents continues to raise questions about the quality of XBRL-tagged information that will be provided by filers under the new SEC requirements. Some companies will outsource the preparation of their XBRL-Related Documents while others will prepare them in-house, in either case with or without the involvement of their auditor. Previous research shows that many of the XBRL documents furnished under the VFP contain validation exceptions, inconsistencies, and errors that could undermine users' confidence in XBRL (Boritz and No 2008; Chou 2006).<sup>21</sup> Therefore, to gain users' confidence XBRL requires mechanisms for reducing uncertainties about the reliability and quality of information released using XBRL. For instance, there is a need to identify factors and processes that facilitate or constrain organizations creating XBRL-Related Documents that completely, accurately, and consistently reflect the business facts in the original financial statements. It would be interesting to investigate whether companies that produce XBRL documents for more than one purpose use the XBRL tags consistently. In addition, research is needed to address specific information integrity objectives for XBRL-Related Documents (e.g., completeness, accuracy, consistency, and compliance) and identify specific audit tasks that preparers and assurance providers would need to perform to achieve these objectives. Such research could result in

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<sup>20</sup> FRAANK is a prototype extraction system that enables users to automatically extract account balances from financial statements and converts them to an XBRL instance document.

<sup>21</sup> For instance, Boritz and No (2008) examined 304 XBRL filings of 74 companies in the VFP between 2005 and 2007 and found that only 104 filings (34.2 percent) passed the instance document validation test, while 272 filings (89.5 percent) passed the taxonomy validation test.

guidelines that would help preparers create reliable XBRL-Related Documents (e.g., perform validation procedures to assess the compliance with XBRL specifications) and assurance providers to evaluate them.

Second, our analysis of XBRL filings indicates that a large proportion of XBRL elements used for notes and MD&A still use a considerable number of taxonomy extensions even though the use of the new taxonomy (i.e., U.S. GAAP Taxonomies 1.0) has reduced the use of taxonomy extensions for financial statement item elements. Current guidance on how to assess the appropriateness of a company's taxonomy extensions is very limited. Thus, another research opportunity is to investigate how well current XBRL taxonomies meet firms' preferred reporting practices and how effectively the tagging process is performed (Bovee et al. 2002), including recommended best practices. It would also be interesting to investigate whether an embedded description explaining why taxonomy extensions are required could reduce preparers', users', and auditors' effort, time, and cost when they review XBRL-Related Documents and increase their confidence in the reliability of those documents.

A third area of concern relates to validation errors. XBRL software generates various validation error messages representing different degrees of error severity. Some errors represent failure to follow mandatory requirements contained in the relevant specifications (e.g., violation of XBRL Specification v2.1). Other errors represent inconsistencies between the coding practices followed by a preparer and suggested, but not mandatory, coding practices (e.g., omitting subtotals). The fact that different software packages generate different error messages compounds the difficulties that users face when they attempt to assess the reliability and quality of XBRL-tagged information. Thus, another possible direction for research involves developing an understanding about which errors should be considered fatal and which ones may be acceptable. This issue relates to materiality. Currently, preparers and assurance providers do not have a clear understanding about what level of compliance with specifications and "best practices" is required for XBRL-Related Documents to be considered as a complete and accurate reflection of the original financial statements "in all material respects."

A fourth potential topic area for research pertains to assurance. The SEC waived assurance requirements for XBRL-Related Documents to moderate the anticipated resistance of SEC filers to this new filing requirement. Although we believe that assurance is necessary and note that two companies have obtained assurance on their filings, we did not address the level of assurance to be provided and the overall economic feasibility of mandating assurance on XBRL-Related Documents. These are areas that merit further study.

A fifth area that could be explored is the feasibility and merit of data-level assurance (Boritz and No 2004; Cohen et al. 2003). At present, assurance is provided for financial statements as a whole. However, with XBRL, assurance providers can offer various levels of assurance at the element level. Since each financial fact (e.g., Accounts Payable) in XBRL instance documents is tagged with an element (e.g., <AccountsPayable>) in XBRL taxonomies, it is possible to provide assurance on specific accounts, each individual financial statement, and the financial statements as a whole. Research is needed to examine the degree of assurance that might be provided (e.g., examination level, review level, agreed-upon procedures level, or other) and address how different levels of assurance provided at the element level could affect users as well as influence assurance engagements, assurance procedures, and auditors' responsibilities. Other researchable assurance issues are how XBRL could be used in a continuous audit context (Murthy and Groomer 2004) and how assurance might be provided on a user-pays basis through a web service (Boritz and No 2004; Elliott 2002).

Sixth, the XBRL filings are subject to limited liability provisions that are anticipated to expire for all companies in 2014 (*CFO Magazine* 2008). A related question for research to address is the potential efficacy and desirability of preventive measures that might be taken by the SEC to ensure the quality of XBRL filings, such as validating all filings prior to accepting them, certifying software designed for creating and validating XBRL instance documents, and developing other measures to discourage companies from engaging in the possible abuse of the limited liability provisions.

Finally, academics with an information system background can provide potential solutions toward the development of XBRL assurance tools; for instance, by reviewing currently available XBRL tools, identifying the key functional requirements of XBRL tools that could assist assurance providers while they are conducting an XBRL assurance engagement, and investigating assurance providers' abilities to effectively utilize such tools.

## VII. CONCLUSION

After years of development, XBRL is now in the implementation stage, with many companies, governments, regulators, and stock exchanges around the world implementing or planning to implement XBRL for electronic filing of financial statements and other business information. There is also a growing awareness about quality assurance issues related to XBRL documents. We believe our findings and conclusions about the practices followed by one of the key participants in the SEC's VFP offer valuable insights to academics as well as XBRL preparers, assurance professionals, and regulators who might be involved in preparing, assessing, or monitoring XBRL-Related Documents.

## APPENDIX GLOSSARY

Calculation link	A calculation link describes how the elements are related by calculation, such as whether they are added or subtracted from each other.
Context	The context is required for understanding a business fact captured as an XBRL element. It contains information about the entity being described, the reporting period, and the reporting scenario.
Element	An element represents a financial reporting concept, including: line items in the face of the financial statements, important narrative disclosures, and rows and columns in tables. For example, the element with the name "CashCashEquivalents" is a concept.
Instance document	An instance document is the financial or business information of the entity tagged with XBRL elements.
Instance document validation	Instance document validation is a process that checks whether the XBRL instance document is consistent with the XBRL specification and the taxonomy extension.
Linkbase	The linkbase is a collection of extended links that document the semantics of concepts in a taxonomy. It consists of five different types of extended links: Label, Reference, Presentation, Calculation, and Definition.
Markup	A markup is a sequence of characters that are inserted at certain places in a text file to indicate how the file should look when it is displayed or to describe the document's logical structure. The markup indicators are often called tags or elements in XBRL.



Reference linkbase	A reference link manages the references to authoritative literature (either online or paper). It contains the data relating to the accounting standard that specifies that the element needs to be disclosed. A reference linkbase is used to relate the references to authoritative literature (e.g., the CashCashEquivalents element is required by FAS No. 95).
Stylesheets	A stylesheet is a mechanism that describes how elements of another document should be displayed. A stylesheet is created using a style sheet language such as Cascading Style Sheets (CSS) and XSLT (Extensible Stylesheet Language Transformations).
Taxonomy	A taxonomy is a dictionary linking agreed-upon financial terms used in preparing financial statements or other business reports and the corresponding XBRL elements. An XBRL taxonomy consists of taxonomy schema and linkbase.
Taxonomy extensions	Taxonomy extensions are taxonomy elements added by a company to a standard (official) taxonomy to compensate for elements the company requires or desires to use for preparing its XBRL-Related Documents but that are missing in the standard taxonomy.
Taxonomy schema	The taxonomy schema provides users with a set of business information elements that allows users to identify business information in a consistent way.
Taxonomy validation	Taxonomy validation is a process whereby a software program analyzes a taxonomy to confirm that the taxonomy complies with the requirements of the XBRL specifications.

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