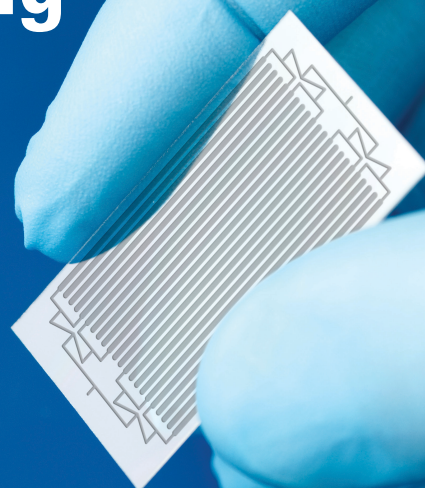


# Nanotechnology and the Practice of Accounting



**S**cientific advances create new materials that are used to enhance existing products and/or create new products. Major advances create new industries and along with these industries come opportunities and risks that impact the financial, managerial and auditing practice of accounting. Historically, some of these advances have altered business and opened new areas of specialization extending the knowledge requirements of accounting practice.

This article examines the “science of the small,” nanotechnology, to introduce CPAs to its social issues, financial issues, risk factors and the potential of a new practice specialty. In a study by Satterfield, et al. published by *Nature Nanotechnology* in 2009, approximately 50 percent of the public said it knew little or nothing about nanotechnology despite predictions that it could vastly change business and society by the year 2015. What is the science of the small? What should be the CPA’s approach to this new science? What is the nature of the firms in this new industrial segment? What are the major risks posed by this emerging technology? What impact might nanotechnology have on the conduct of business and on the accounting profession in its roles as advisors, business development

consultants and auditors? What is the potential for a new area of practice specialization?

## Science of the Small

Tiny particles are put into the blood stream, travel to individual cancer cells and kill them. Cancer cured. Billions of tiny solar cells atop houses and office buildings produce all needed electricity. Imagine, all these advances being virtually free; this is the vision of nanotechnology. Every day, researchers are discovering and isolating new molecules, understanding their properties and working to commercialize them. Collectively, China, Japan and South Korea could be more advanced in development than the United States; no one knows. These countries are investing major resources into nano-research.

The commercial applications of these products continue to grow; more than 1,300 products in all major industries now incorporate nano-particles. A recent example is the use of nano-particles in the lining of LG and Samsung refrigerators to prevent bacteria-forming mold from attaching to the liner. Nanotechnology is a broad-based general purpose technology impacting almost every aspect of modern

society. Experts in the area see major reshaping of manufacturing, medicine, services provision, information technology and business processes occurring simultaneously, called convergence.

The unit of measurement is the nanometer, a billionth of a meter. This unit is incredibly small; for example, a human hair is about 100,000 nanometers in diameter. The first man-made particles were “buckyballs” and carbon tubes. The “buckyballs” were fashioned from graphene, a cousin of graphite (the so-called “lead” in pencils), consisting of about 60 atoms.

The new structures being created don’t act like the molecules of their big brothers; they tend to have different electrical and chemical properties. Take nano-gold. Unlike real gold, it will not conduct electricity; it’s a liquid and it’s red. Nano-gold is the leading candidate for cancer drugs. Another example is nano-aluminum. It’s instantly explosive when it contacts oxygen; it’s being considered for rocket fuel. Buckyballs are being looked at as containers for molecules as they shield molecular particles from the environment, preventing dangerous interactions.

### The CPA’s Approach to Nanotechnology

CPAs think incrementally and expect refinement, not revolution. For example, first we used room-sized computers and miles of magnetic tape (reels), then desktops and now cloud computing. Looking back, it seems inevitable and it was manageable. But what if several technological breakthroughs occur simultaneously? What if every imaginable software application that accounting firms or their clients use was available at the same time at virtually no cost on the Internet in 2017? What if every type of accounting software simply appeared from the hands of Chinese firms that had created it by using DNA molecules (called wet nanotechnology), each of these “thinking” molecules akin to having a million programmers writing software?

Accompanying all of this software appear desktop computers capable of storing the entire Library of Congress in a unit the size of a sugar cube. Meanwhile, nano-sensors count money, record transactions and prepare daily financial statements. This sounds like science fiction, but given the large worldwide investment in nano-research, this is indeed possible.

Convergence may not occur or it may not be as soon as forecast. Believing, however, that nano-tech looms too far in the future to give it practical importance now may disserve one’s career. The truth is that nano-particles are already used in flat screen TVs and monitors, a billion cell phones, printers’ ink and more than 1,300 other consumer products. No one has a true idea of the actual usage in industrial products, although thousands of tons of carbon-based nano-particles are produced each year for use in tires. Cosmetics and sunscreens contain nano-particles. The titanium shafts of some golf clubs employ them. Armed with knowledge, the accountant can embrace broader truths about nanotechnology and understand its potential impact.

### The Structure of the Segment

Many nanotechnology startup firms are the outgrowth of government-sponsored research. Their founders are academics with no business experience who obtain additional grants to develop the process for manufacturing a nano-material enhanced product.

During this early period, they fail to receive sound financial advice, which handicaps the firms’ ability to move forward with the implementation phase of business. The second and stronger players in the segment are firms that developed a nano-material and/or are in the process of applying it for their own industry. The firm can achieve greater financial rewards by licensing the technology to other noncompeting firms across multiple industries. These firms commonly choose to use an intermediary to conduct this outreach. For example, a Canadian manufacturer that holds a patent on a process utilizing nano-carbon tubes employs a U.S. venture capital firm, as grantor of its patent rights, to actively seek licensees in diverse industries to utilize the nanotechnology.

### Risks

An underlying consideration in choosing the second party grantor model is its ability to shield the creator firm from the unknown risks created by this new particle. These risks may be significant, and their impact on clients should be clearly understood by CPAs.

### Health and Human Safety Risk

New manufacturing processes and materials create risks, and the CPA needs to be knowledgeable, plus able to assess and address these risks from a financial, managerial and auditing point of view. Given the size and make up of nano-particles, environment, health and safety (EHS) concerns are often the first risks cited. In 2000, the federal government established the National Nanotechnology Initiative (NNI) to “support responsible development of nanotechnology.” The NNI is overseen by The Nanoscale Science, Engineering and Technology Committee (NSET), a subpart of the National Science and Technology Council (NSTC). In 2006, the NNI established the Nanotechnology Environment and Health Implications Working Group, which defined five EHS research areas:

1. Instrumentation, Metrology and Analytical Methods
2. Nano-materials and Human Health
3. Nano-materials and the Environment
4. Health and Environmental Exposure Assessment
5. Risk Management Methods

The NNI Subcommittee on Nanoscale Science released its *Strategy for Nanotechnology-Related Environmental, Health and Safety Research* in 2008, which provided a risk-management model and timeline for EHS nanotechnology. The timeline indicated that by 2015, many new nano-materials were projected to be in production and the funding for population impact research would have just begun. Based on the timeline, it will be 2021 or later before Occupational Safety and Health Administration (OSHA) will know the impact of nanotechnology on the environment.

In 2011, the *Strategy for Nanotechnology-Related Environmental, Health and Safety Research* was updated. The new plan established research goals for human health, environment and human exposure research, and an information repository to expedite the communication of research outcomes. The goal is to use predictive modeling and informatics to allow the federal agencies whose responsibilities fall

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under the three research areas to apply risk-management models in regulating the implementation of nanotechnology.

The plan abandoned the timeline established in the 2008 document in favor of a 10-year “Roadmap” developed by the *Nanoinformatics 2010 Workshop*, with a goal to speed the development of regulations. From a risk point of view, the producers of nanotechnology-based products face two risks. The first is that the government using risk models based on preliminary studies could overreact and remove a product from the market. The second is that their product could later be shown to have adverse effects not only on consumers, but also on workers, resulting in costly litigation – asbestos on steroids so to speak. This possibility is reflected in a statement by the AFL-CIO reported in the *New Haven Independent*, which indicated it was “walking blind” when it came to workplace risks.

### Patent Risks

The EHS and manufacturing processes are creating a secondary industry focused on the development of methods to accurately analyze, measure and track nano-materials. The explosion of new materials, products, process and tools plus the coming convergence could result in an explosion of patent applications. The existence of firms outside of the United States working simultaneously on developing nanotechnology makes protecting the value through the patent process a complicated matter. Given the level of worldwide government sponsorship of this new science, the cost of securing patents and/or defending a patent across international jurisdictions could require a firm to expend significant resources. In fact, a material itself may not be patentable, but the process of producing it could be. Further complications arise as a result of China being one of the major players in the nanotechnology development race. The Chinese do not recognize foreign patents, so instead of firms securing a patent providing protection, the patent could open the door for unauthorized and competing products. This suggests that instead of patenting a manufacturing process, a firm might pursue the strategy of treating the process as a trade secret.

Where a patent exists on a nano-material that can be employed in different products across multiple industries, the licensee model comes into play. The allocation of patent enforcement rights creates another important risk. The licensee needs to assure that the license provides for infringement enforcement protection and sole application of the patent within the product area. The license should include a failure-to-act provision allowing for action by the licensee should the patent holder fail to pursue violations that impact the licensee’s market and profitability.

In addition, the licensee should be granted the ability to participate in the allocation of any damage awards where the licensee’s business has been negatively impacted and the grantor successfully litigates the infringement. Additionally, the licensee should have the right to seek damages and injunctive relief should the grantor license the technology to a competitor of the licensee.

### Impact on Business and Accounting

The nature of the industry, the EHS and patent aspects of the nanotechnology present financial reporting and business risk issues. The CPA needs to work closely with the client in addressing the needs

of both internal and external stakeholders. As noted, the EHS risks are not currently known. Firms need to engage in sound risk-management assessment practices, risk analysis and active risk mitigation in order to shield their current and future profitability.

Besides contributing to a client’s risk mitigation activities, the CPA needs to be proactive in monitoring changing financial reporting trends that could increase the firm’s financial risk. Since 2010, the Securities and Exchange Commission (SEC) has increased its focus on environmental impact as part of Regulation S-K (Business, Legal Matters) and Management Discussion & Analysis (MD&A). In addition, the push toward sustainability reporting needs close attention.

Not only are there pending reporting and financial issues for SEC client firms that accountants need to monitor, recent actions by the Financial Accounting Standards Board (FASB) suggest the potential of future financial reporting risks for all clients. In August 2010, FASB met to consult with the staff on drafting a “final” pronouncement on contingent liabilities. Proposed Accounting Standards Update, *Contingencies (Topic 450) Disclosure of Certain Loss Contingencies* leaves the current test for disclosure of “unasserted claims” unchanged except for the replacement of “at least reasonably possible” with “more than remote.” Careful examination of the exposure draft indicates nanotechnology firms are part of the group that “represent a unique set of loss contingencies for which specific guidance is necessary.” During the September 2010 board meeting, FASB approved two modifications to the respective interpretive paragraph, 450 20 55 14. The first was the addition: “an entity should consider all evidence available to it” when determining whether to disclose a potential unasserted claim. The second focused on industries where there exists “peer reviewed studies in reputable scientific journals that indicate potential hazards related to the entity’s products.” While the board has not issued a final pronouncement, it has signaled a continued interest in strengthening the contingent liability reporting requirements.

Given the revolutionary nature of the technology, a high probability exists that nanotech firms will have to react to adverse EHS study findings. The nanotechnology-aware CPA will play two significant roles in response to this event. First, as an auditor, the accountant may have to assure the required disclosures meet changing SEC and FASB standards. The second role may come as part of the advisory function in documenting either the processes used to develop loss estimates or that potential losses are not determinable. Today’s accountant who is familiar with nanotechnology and looking ahead at this future risk could be invaluable in laying a foundation that allows the firm to mitigate any challenge that arises in this uncertain environment.

### Startup Problems and Raising Capital

Many of the startup firms will have tax and financing issues similar to other firms. However, because the initial capital for some nano-developers is government grants and the founder is an academic with no business experience, many nano-startups are financially handicapped. The founders do not realize the need for an accountant until the company seeks traditional financing and must produce audited/reviewed financial statements. At this stage, many of these firms will have committed tax or financial missteps due to their efforts to use more of the grants’ funds for research. For example, the

records indicate funds were paid as salary to the primary researcher, firm founder, as specified in the grant; while in actuality, the cash was retained, a liability accrued and no income taxes were paid on the amounts specified as salary in the grant.

### Potential as a New Practice Area

According to the Project on Nanotechnology, Texas is one of the top four states involved in research and nanotechnology development. This opens the door to developing a firm's expertise into serving this new industry. Become a specialist or designate a younger member of the firm as a specialist. The specialist's role will be to research the technology and then promote the firm's expertise within the existing client base and the community.

Nanotechnology startups can benefit greatly from sound business and financial advice. Where several companies are operating in a CPA firm's area, a public service seminar on tax and financial aspects of using government grants to fund a startup business could open the door to future involvement of local startups with the CPA firm and help the research-focused academic founders avoid early pitfalls.

### Where Will Your Firm be in 2017?

Nanotechnology is here; clients are using it, and its impact on business in the future is inevitable. The timing and extent of the impact, however, is debatable. The reality is that an existing material

could radically change a client's products and transform his/her firm. The CPA who is proactive in this area will be in a position to capitalize on the opportunities nanotechnology offers while working closely with clients to minimize their exposure as they seek to employ this new technology.

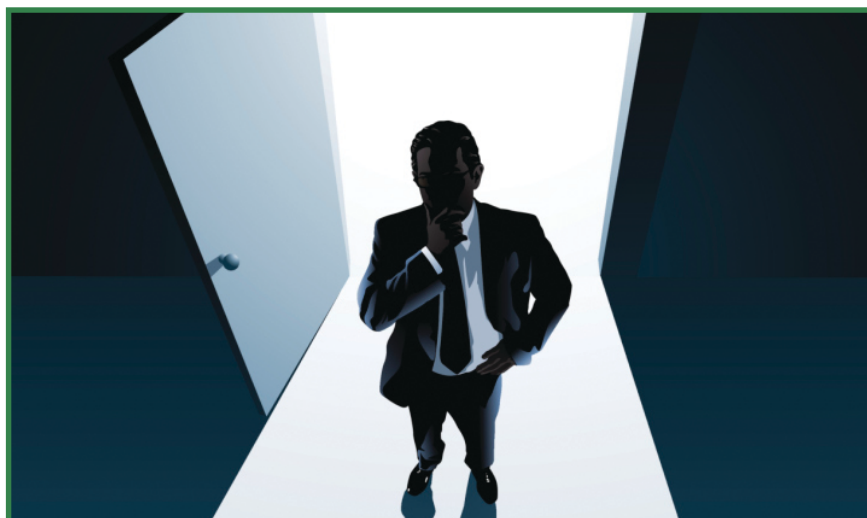
Given the lack of knowledge in the general population, a client may have no idea that a nano-material exists that could vastly improve his/her product. What if his/her CPA does and introduces the client's firm to it? It could only take one startup or one existing client's emergence as a dynamic industry leader to create a ripple effect that will dynamically enhance a firm's revenue and reputation. ■

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