

Survey *Economic Impacts of Nanotechnology Documentary Standards*

Introduction

NIST is conducting its first economic impact assessment of a suite of documentary standards aimed at advancing an emerging technology. NIST has conducted numerous economic impact assessments over the years. For examples of such assessments, go to < http://www.nist.gov/director/planning/study_info.cfm>.

The survey population was chosen on the basis of their interest in, and familiarity with, nanotechnology documentary standards and their first-hand knowledge of the documentary standard development process.

The focus of the survey is nanotechnology documentary standards published between 2005 and 2012 by the following Standards Development Organizations (SDOs): ASTM International's Technical Committee on Nanotechnology (ASTM E56); the International Electrotechnical Commission's (IEC's) Technical Committee (IEC/TC113), Nanotechnology Standardization for Electrical and Electronics Products and Systems; and the International Standards Organization's (ISO's) Technical Committee (ISO/TC229), Nanotechnology. (See the list of relevant standards in Appendix A of this survey instrument). The choice of this group of standards was pragmatic. They are considered good candidates for understanding the role and economic significance of documentary standards in a field of emerging technologies.

*TASC Inc. is an independent analytical services company. We have conducted several such assessments on NIST's behalf. **All the answers you provide will be held in the strictest confidence. They will not be shared with NIST or the standards development organizations whose standards are the focus of the analysis. All data in the economic impact assessment will be reported in aggregated form, as averages and ranges, so that no individual person, company, or establishment data will be discernable.***

The impact assessment will be based on data collected for this survey and will employ a present discounted value approach to organizing time series estimates of benefits and costs provided by you, the survey respondents. The data will be used to calculate estimates of the economic impact according to NIST's conventions.

We need you to provide your best estimates to all questions. Where these take you past your comfort zone, consider that there is likely no one in a better position to formulate a response. If, in addition to your response, you would like to suggest a point of contact within your organization whose estimate we would also benefit from obtaining, please provide us with a name, phone number, and e-mail address. We will contact that person and solicit their estimates as well. We welcome this opportunity.

As a token of appreciation for participating in this survey effort, the final report will be available from NIST in late 2013 and you and your company will be listed in the acknowledgements unless you prefer that they not be. Your full participation in the survey assures that the report will be based on the best information available.

NOTE: This collection of information contains Paperwork Reduction Act (PRA) requirements approved by the Office of Management and Budget (OMB). Notwithstanding any other provisions of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA unless that collection of information displays a currently valid OMB control number. Public reporting burden for this collection is estimated to be twenty-five (25) minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed and completing and reviewing the collection of information. Send comments regarding this burden estimate or any aspect of this collection of information, including suggestions for reducing this burden, to the National Institute of Standards and Technology, **Attn: Erik Puskar; Phone: 301-975-8619. OMB Control No. 0693-0033; Expiration Date: 03-31-2016**

Respondent Name:	Click here to enter text.
Contact Information (email address or /phone #):	Click here to enter text.
Organization Name:	Click here to enter text.

If your organization has a broad product line of which nanotechnology-related products and services are a part:

Relevant Sub Division Name:	Click here to enter text.
Relevant Sub Division Technical or Product Focus:	Click here to enter text.

Background Information

1. The nanotechnology value chain consists of multiple tiers. Please indicate the industry tiers that best characterize your company's (or relevant division's) role.

Click here to enter text.	Waste management
Click here to enter text.	End product development and application
Click here to enter text.	Nanomaterial synthesis
Click here to enter text.	Raw materials producer
Click here to enter text.	Instrument manufacturer
Click here to enter text.	Internal testing laboratory
Click here to enter text.	Internal R&D laboratory
Click here to enter text.	Independent testing laboratory
Click here to enter text.	Independent R&D laboratory (including universities)
Click here to enter text.	Other (Please specify and offer an explanation of your role.) Click here to enter text.

2. In which of the nanotechnology SDO's identified has your organization participated?

Click here to enter text.	ASTM E56
Click here to enter text.	IEC/TC113
Click here to enter text.	ISO/TC229
Click here to enter text.	We HAVE NOT participated in these nanotechnology SDOs. [Skip to question #7.]

3. In what year did your organization first become active in one or more of the SDOs identified above? (If your involvement was instrumental in the formation of one of the above-mentioned organizations indicate the year in which you became involved even if it precedes for formal establishment of the SDO as indicated in the parenthesis.)

ASTM E56 (2005) — Year First Active:	Click here to enter text.
IEC/TC113 (2007) — Year First Active:	Click here to enter text.
ISO/TC229 (2005) — Year First Active :	Click here to enter text.

4. If NIST personnel had not been involved in the SDOs in which your organization participated, estimate the number of weeks that the SDO's publications would have been delayed — on average, across the nanotechnology standard development efforts in which your organization was involved.*

Average Weeks of Delay:	Click here to enter text.
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Benefits and Costs Estimates

Nanotechnology Working Group Participation

5. Estimate the average annual number of hours your organization’s employees or consultants actually dedicated to all the nanotechnology standards working groups in which they were involved (indicated in your response to question #3 above) from their initial involvement through 2012.

ASTM E56, IEC/TC113, ISO/TC229: Average Annual Hours, “Year First Active” through 2012:	Click here to enter text.
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6. In 2013 dollars, estimate the value of the fully burdened (i.e., including benefits such as retirement and health) annual compensation for a full-time person with the requisite expertise to participate in the efforts of a nanotechnology working group.

Total annual compensation for one full time person in 2013 dollars \$	Click here to enter text.
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All data in the economic impact assessment will be reported in aggregated form, as averages and ranges, so that no individual person, company, or establishment estimates will be discernable.

Absent Nanotechnology Standards

Economic impact assessments are often conducted on the basis of a “counterfactual scenario” that posits how things would have been in the absence of the event being assessed. We hypothesize that, prior to the consensuses represented by the 49 nanotechnology standards identified in Appendix A, more time was required of you and your colleagues in the performance of a wide range of activities.

7. From the list of nanotechnology standards listed in Appendix A, identify — by list number — the five (more if need be) that you think are representative of the most significant nanotechnology consensus standards for your organization.

Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

* For reference, Appendix A lists the nanotechnology standards that are the principal focus of this survey. The two numbers after the dash (-) in the numerical designation of the ASTM standards indicate the date of publication. The publication dates of ISO/TC229 standards are clearly indicated. The publication dates for TC113 standards are provided in parentheses following the title.

8. In Nanotechnologies-Related Activities Table below, select the top 3 activities within your organization that you judge have been most affected by nanotechnology standards and estimate the percent of all the benefits from nontechnology standards that each of these 3 activities represent. *(For example, your top 3 activities could each account for 33% of all benefits equally, leaving very little benefits accounted for by other activities; or they could account for 50%, 30% and 2%, leaving the unspecified 18% of all benefits spread among the remaining activities.)*

Nanotechnology-Related Activities Table

Pre-Development R&D/ Knowledge Acquisition %	Worker/Student Training %	Investment Justification for Equipment Adoption /Acquisition %	Product Design & Development (excl. regulatory compliance) %	Quality Assurance & Control %	Safety and Environmental Monitoring/Risk Management %
Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.
Contract Negotiations %	Intellectual Property Due Diligence %	Regulatory Compliance, Negotiations, & Monitoring %	Marketing, Marketing Intelligence, & B2B Networking %	Other (Describe) %	Other (Describe) %
Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.

9. For the 3 activities selected in the Nanotechnologies-Related Activities Table above, provide a few sentences describing how the existence of nanotechnology standards changed the processes that resulted in benefits to your organization. (A few words are far more helpful than no words.)

Click here to enter text.

10. For the activity with the highest percentage benefits to your organization (from the Activities Table above), estimate one-time labor and material costs — “pull costs” — associated with assimilating the information contained in the standards into your ongoing processes. (DO NOT include cost associated with participating in SDO activities, if any, as these are already estimated in your response to question #6.)

Material costs \$	Click here to enter text.
Year incurred	Click here to enter text.
Number of full-time persons years	Click here to enter text.
Year incurred	Click here to enter text.

All data in the economic impact assessment will be reported in aggregated form, as averages and ranges, so that no individual person, company, or establishment estimates will be discernable.

11a. In column A, of the Activity Benefits Table, for the activity with the highest percentage benefits to your organization (from the Activities Table above), estimate the number of full-time person-years (FTPs) in 2012 dedicated to nanotechnology-related efforts in that category of activity.

Activity Benefits Table

Column A Full-Time Person-Years (FTPs) Dedicated to this Activity (2012) (E.g., 0.5, 1, 5.5, 10)	Column B Annual Compensation of an FTP w/ Appropriate Expertise (\$ FY2013)	Column C Multiple of FTPs Dedicated to this Activity Absent the Relevant Nanotechnology Standards (E.g., .5X, 1X, 2.5X, 10X)	Column D Average Annual Rate of Growth in the Level of Nanotechnology-Related Activities 2005-2012 (Percent)
Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.

All data in the economic impact assessment will be reported in aggregated form, as averages and ranges, so that no individual person, company, or establishment estimates will be discernable.

11b. In *column B*, of the Nanotechnologies-Related Activities Table, estimate the fully burdened annual compensation (i.e., including benefits such as retirement and health) for a full-time employee with the requisite expertise to engage in the selected activity.

11c. In *column C* of the Nanotechnologies-Related Activities Table, estimate the multiple of FTPs that it would take to perform this function in the absence of consensus nanotechnology standards, holding constant the 2012 level of activity.

11d. In *column D* of the Nanotechnologies-Related Activities Table estimate the average annual rate of growth in the level of this nanotechnology-related activities, 2005-2012.

12a. If the sale of any products or services would have been delayed in the absence of nanotechnology standards, what is the average annual revenue from those sales, and how many weeks delay would have been incurred?

Average annual revenue (2005-2012)	Click here to enter text.
Number of weeks delay	Click here to enter text.

All data in the economic impact assessment will be reported in aggregated form, as averages and ranges, so that no individual person, company, or establishment estimates will be discernable.

12b. Please provide a brief description of the products or services delayed. (A few words are better than no words.)

Click here to enter text.

Scaling the Benefits of Nanotechnology-Related Activities

13a. How many companies do you directly compete with, or collaborate with, in the sale of nanotechnology-related services or products to major customers?

Number of direct competitors and collaborators:	Click here to enter text.
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13b. How many of your direct competitors and collaborators likely realized benefits and costs comparable to those you estimated in your responses to questions #8a-g?

Number of direct competitors/collaborators realizing comparable benefits from nanotechnology standardization	Click here to enter text.
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13c. If all the benefits realized by your direct competitors/collaborators summed to 100, what percent is represented by the benefits your organization realized?

Percent of total direct competitor/collaborator benefits?	Click here to enter text.
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Thank you for taking the time to provide your best estimates for the answers to the above questions.

We look forward to providing you with the results of our analysis.
Appendix A

Nanotechnology Standards 2005-2012

ASTM (E56) Standards

List Number

1. E2456-06 Standard Terminology Relating to Nanotechnology
2. E2490-09 Standard Guide for Measurement of Particle Size Distribution of Nanomaterials in Suspension by Photon Correlation Spectroscopy (PCS)
3. E2524-08 Standard Test Method for Analysis of Hemolytic Properties of Nanoparticles
4. E2525-08 Standard Test Method for Evaluation of the Effect of Nanoparticulate Materials on the Formation of Mouse Granulocyte-Macrophage Colonies
5. E2526-08 Standard Test Method for Evaluation of Cytotoxicity of Nanoparticulate Materials in Porcine Kidney Cells and Human Hepatocarcinoma Cells
6. E2535-07 Standard Guide for Handling Unbound Engineered Nanoscale Particles in Occupational Settings
7. E2578-07 (2012) Standard Practice for Calculation of Mean Sizes/Diameters and Standard Deviations of Particle Size Distributions
8. E2842-12 Standard Guide for Measurement of Particle Size Distribution of Nanomaterials in Suspension by Nanoparticle Tracking Analysis (NTA)
9. E2859-11 Standard Guide for Size Measurement of Nanoparticles Using Atomic Force Microscopy (AFM)
10. E2865-12 Standard Guide for Measurement of Electrophoretic Mobility and Zeta Potential of Biological Materials

IEC (TC113) Standards

List Number

11. ISO 80004-4 Ed. 1.0_Nanotechnologies - Vocabulary - Part 4: Nanostructured materials (2011)
12. ISO/TS 13278 Ed. 1.0_Nanotechnologies - Determination of metal impurities in carbon nanotubes (CNTs) using inductively coupled plasma - Massspectroscopy (ICP-MS) (2011)

13. ISO/TS 80004-1 Ed. 1.0_Nanotechnologies - Vocabulary - Part 1: Core terms (2010)
14. ISO/TS 80004-2 Ed. 1.0_Nanotechnologies - Vocabulary - Part 2: Nano-objects - Nanoparticle, nanofibre and nanoplate (2008)
15. ISO/TS 80004-5 Ed. 1.0_Nanotechnologies - Vocabulary - Part 5: Nano-bio interface (2011)
16. ISO/TS 80004-7 Ed. 1.0_Nanotechnologies - Vocabulary - Part 7: Healthcare - Diagnostics and therapeutics (2011)

ISO (TC229) Standards

List Number

17. ISO/TS 27687:2008 – Nanotechnologies -- Terminology and definitions for nano-objects -- Nanoparticle, nanofibre and nanoplate
18. ISO/TR 12885:2008 – Nanotechnologies – Health and safety practices in occupational settings relevant to nanotechnologies
19. ISO/TR 11360:2010 – Nanotechnologies – Methodology for the classification and categorization of nanomaterials
20. ISO/TS 80004-3:2010 – Nanotechnologies --Terminology and definitions –Part 3: Carbon nano-objects
21. ISO/29701:2010 - Nanotechnologies --Endotoxin test on nanomaterial samples for in vitro systems -- LAL Assay
22. ISO/TS 10867:2010 – Nanotechnologies -- Characterization of single-wall carbon nanotubes using near infrared photoluminescence spectroscopy
23. ISO/TS 80004-1:2010 – Nanotechnologies – Vocabulary – Part 1: Core terms
24. SO/TR 12802-2010 – Nanotechnologies – Model taxonomic framework for use in developing vocabularies – Core concepts
25. ISO/TS 11251-2010 – Nanotechnologies – Characterization of volatile components in single-wall carbon nanotube samples using evolved gas analysis/gas chromatograph-mass spectrometry
26. ISO 10801:2010 – Nanotechnologies --Generation of metal nanoparticles for inhalation toxicity testing using the evaporation/condensation method

27. ISO 10808:2010 – Nanotechnologies --Characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing
28. ISO/TR 13121:2011 – Nanotechnologies -- Nanomaterial risk evaluation
29. ISO/TS 10798:2011 - Nanotechnologies -- Characterization of single-wall carbon nanotubes using scanning electron microscopy and energy dispersive X-ray spectrometry analysis
30. ISO/TS 10868:2011 - Nanotechnologies -- Characterization of single-wall carbon nanotubes using ultraviolet-visible-near infrared (UV-Vis-NIR) absorption spectroscopy
31. ISO/TS 80004-7:2011 - Nanotechnologies -- Vocabulary -- Part 7: Diagnostics and therapeutics for healthcare
32. ISO/TS 13278:2011 – Nanotechnologies – Determination of metal impurities in samples of carbon nanotubes using inductively coupled plasma massspectrometry (ICP-MS)
33. ISO/TS 11308:2011 – Nanotechnologies – Characterization of single-wall carbon nanotubes using thermogravimetric analysis
34. ISO/TS 11888:2011 – Nanotechnologies - Characterization of multiwall carbon nanotubes -- Mesoscopic shape factors
35. ISO/TS 12805:2011 – Nanotechnologies -- Materials specifications – Guidance on specifying nano-objects
36. ISO/TS 80004-4:2011 – Nanotechnologies – Vocabulary – Part 4: Nanostructured materials
37. ISO/TS 80004-5:2011 – Nanotechnologies – Vocabulary – Part 5: Bionano interface
38. ISO/TR 10929:2012 - Nanotechnologies -- Characterization of multiwall carbon nanotube (MWCNT) samples
39. ISO/TR 13014:2012 - Nanotechnologies - Guidance on physicochemical characterization of engineered nanoscale materials for toxicologic assessment
40. ISO/TS 10797:2012 – Nanotechnologies -- Characterization of single-wall carbon nanotubes using transmission electron microscopy (TEM)
41. ISO/TR 11811-2012 – Nanotechnologies -- Guidance on methods for nano- and microtribology instruments