

Draft Survey Instrument
Flat Panel Display Measurement Standard (1.0, 2.0) Economic Impact

Introduction

NIST is conducting its first economic impact assessment of a documentary standard. 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>.

*TASC Inc., an independent analytical services company, is conducting this assessment on NIST's behalf. All the answers you provide will be held in the strictest confidence. **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 Flat Panel Display Measurement (FPDM) standard (FPDM 1.0 and FPDM 2.0), (developed by the FPDM Workgroup of the Video Electronics Standards Association (VESA)) has been selected as the basis for this first assessment of documentary standards. The choice of FPDM has no strategic significance. It was deemed the best candidate of a small number of projects from an impact assessment perspective.

Members of the ICDM were chosen as the survey population because of their interest and familiarity with the subject matter and their first-hand knowledge of the documentary standard development process. ICDM members represent all the value chain tiers of the flat panel display industry.

The impact assessment will be based on data collected for this survey and employs a present discounted value approach to organizing time series estimates of benefits and costs provided by you, the survey respondents. The data will be compiled to calculate several measures of economic impact.

Because this survey concerns the past, and because we are sensitive to the burden placed on industry respondents, we expect that many of the questions posed will be answered on the basis of your judgment, using conventional rules of thumb. Your seasoned judgment is what we seek.

This survey has two parts. Part I addresses the efficiency implications of FPDM-related measurement technology on your company's operations, the operations of your immediate suppliers and buyers, and on the efficiency of the FPDM working group process. Answers to Part I require estimates of real resource costs and benefits. Part II seeks to gather the smallest amount of dollar-denominated data required to estimate downstream benefits; benefits that are based on various buyers "willingness to pay." Part II represents an innovative approach to measuring economic impact that, if successful, could reduce the burden of estimating economic impact. So we sincerely hope that you will take the time to provide estimates to the additional questions in that part.

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 2010 and you and your company will be listed in the acknowledgements. Your full participation in the survey assures that the report will be based on the best information available.

NOTE: This survey contains collection of information requirements subject to the Paperwork Reduction Act. Notwithstanding any other provision 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 Paperwork Reduction Act, unless that collection of information displays a currently valid OMB control number. The estimated response time for this survey is 30 minutes. The response time includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information." **OMB Control No. 0693-0033; Expiration Date: 10/31/2012.**

Survey Part I

Background Information

1. The flat panel display industry consists of multiple tiers or facets. Please indicate the industry tiers that best characterize your company's role in the industry.

- End user** (e.g., general or professional consumer)
 - Original equipment manufacturer** (e.g., Dell, Sun Microsystems, HP, Apple, Sony, Samsung or Boeing, Lockheed-Martin, Raytheon, Northrop-Grumman)
 - Display Manufacturers** (e.g., Samsung, LG, AUO, CMO, CPT, HannStar or aerospace display manufacturers such as Honeywell, Rockwell-Collins, American Panel Corp.)
 - Display component manufacturers**
 - Equipment manufacturers (including measurement instruments)**
 - Testing laboratories**
 - Other** (Please specify and offer an explanation of your role in the industry.)
-
-
-

2. For the tier(s) in which your company operates, please estimate the total sales value (in current "then year" dollars) of the worldwide market and U.S. market for

products and services that are significantly affected by FPDM and your company's shares of those markets over time.

	1992	1993	1994	1995	1996	1997	1998	1999
Worldwide Sales (\$)								
Company Share (%)								
	2000	2001	2002	2003	2004	2004	2006	2007
Worldwide Sales (\$)								
Company Share (%)								

3. What facets of your company's operations are most affected by the measurement data and techniques represented in the FPDM.

- R&D**
- Qualification of displays for use in complementary products/services**
- Manufacturing process quality control**
- Acceptance testing**
- Complaint adjustment**
- Other** (Please specify and explain for a non-expert.)

4. In what year did your company adopt FPDM as its measurement standard?

FPDM 1.0 ___ ___ ___ ___
 FPDM 2.0 ___ ___ ___ ___

Costs and Benefits Estimates

FPDM Workgroup Participation

For the purposes of this assessment, VESA's FPDM workgroup was constituted in 1992 and continued through 2007 (when the workgroup's activities were transferred to SID's, ICDM). In the analysis of survey data, we will distinguish two periods, 1992-1998 (that includes the release of FPDM 1.0 in 1998) and 1999-2007 (that includes the release of FPDM 2.0 in 2001).

5. In the table below, estimate the average annual number of hours your company employees or consultants actually dedicated to the FPDM workgroup, by year, 1992-2007.

	1992	1993	1994	1995	1996	1997	1998	1999
Average Annual Hours								
	2000	2001	2002	2003	2004	2004	2006	2007
Average Annual Hours								

6. In 2010 dollars, estimate the value of the annual compensation a full-time equivalent (FTE) employee with the requisite expertise to participate in the efforts of the FPDM workgroup.

Total annual compensation for one FTE in 2010 dollars \$ _____

Absent FPDM

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. Prior to the release of FPDM 1.0, producers or buyers of flat panel displays would consult any (or all) of a number of existing standards (depending on the specific application) and develop their own methodologies for assessing display quality, often in consultation and coordination with their suppliers and buyers.¹

¹. According to an authoritative source, the following standards were available for consultation: ISO 9241 (Parts 3, 7, 8) and ISO 13406 (draft 2); ANSI HSF-100 (1988) and IT7.215 (1992); EIA TEB (27) and TEP (105); VESA Display Specifications and Test Procedures (for CRTs); NIDL’s Procedures for Evaluation and Reporting the Capabilities of High Performance Display Monitors for Imagery Applications; SAE ARP 1782 and ARP 4260; MRP 1990:8 (1990:10); USAF AFGS 87213A; and IEC SC 47C. Consulting these various uncoordinated standards presented measurement difficulties because they described what the FPD was to do, not how it was to be tested; the various standards were not aligned for any specific purpose; they provided only partial solutions to characterization, specification, or qualification task and required the buyer and/or supplier to develop consolidated and integrated proprietary specifications and qualifications; often provided inadequate measurement methods; and often assumed that measurement techniques for older technologies (e.g., CRTs) transferred well to new technologies (e.g., LCDs). See, Edward F. Kelley, George R. Jones, Paul A. Boynton, Michael D. Grote, and Dennis J. Bechis. ”A Survey of the Components of Display Measurement Standards,” Journal of the Society for Information Display, Vol. 3, No. 4, December 1995, pp. 219-222.

For evaluation purposes, we posit a counterfactual scenario with two phases labeled, “do-it-yourself” and “find another home.”

7. For the period 1992-1998 (release of FPDM 1.0, 1998) estimate the average annual number of hours expended by your company (and, in parenthesis, its suppliers and buyers) in “do-it-yourself” solutions to problems and issues for which the information in FPDM 1.0 provided an alternative or complementary solution.

	1992	1993	1994	1995	1996	1997	1998
Average Annual Hours	()	()	()	()	()	()	()

Please provide some typical examples of the types of problems and issues you have in mind in your response to Question #7.

8. In 2010 dollars, estimate the value of the annual compensation a full-time equivalent (FTE) employee with the requisite expertise develop “do-it-yourself” solutions to problems and issues for which the information in the FPDM provided alternative or complementary solutions.

Total annual compensation for one FTE in 2010 dollars \$ _____

9. Please identify an organization (“another home”) that, in your view, would likely have developed an alternative to FPDM, had VESA not undertaken the effort, and the year the FPDM alternative would have emerged in that scenario.

Alternative organization: _____

Year an FPDM alternative would have emerged: ____ _

Please provide your rationale for both responses:

FPDM Quality

The developers of the FPDM strove to develop a standard with following attributes:

- *Reproducible* — Everybody can get the same results on the same display using appropriate instrumentation.
- *Robust* — Insensitive to small changes in the measurement apparatus that will affect the ease with which reproducibility is attained.
- *Unambiguous* — The method is clearly stated and easily understood. Important details that are required for success are not left out.
- *Extensible* — Applicable to as many different technologies as possible permitting inter-comparisons of technologies.
- *Distinct* — The name of a measurement method must be chosen so that it is not confused with another metric.
- *Honest* — The measurement method is not devised to hide an obvious deficiency.
- *Accommodating* — Enable as broad a range of apparatus as possible.
- *Accessible* — Avoiding the use of unusual, highly specialized, or otherwise arcane apparatus or methods unless it is necessary.
- *Simple* — Procedures should be made as uncomplicated as possible, avoiding deliberate obscuration.
- *Meaningful* — Properly captures the visual experience for task and environment.

The following questions ask you to assess FPDM’s achievement in terms of these attributes; to assess the alternative that would have emerged in the absence of VESA’s FPDM workgroup (your answer to Question #9 above); and to estimate the effect of any differences in the resources your company would have had to commit in the counterfactual scenario.

10. On the 7-point scale provided, assess the extent to which FPDM 1.0 achieved these attributes and the extent to which the “FPDM alternative” (your response to Question #9) would have achieved them.

(1 = full realization of the attribute; 7 = realization of the attribute is insignificant)

Attribute	FPDM 1.0							FPDM Alt.						
Reproducible	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Robust	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Unambiguous	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Extensible	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Distinct	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Honest	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Accommodating	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Accessible	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Simple	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Meaningful	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	Full Realization							Insignificant Realization						

11. On the scale below, please estimate the relative effectiveness of the “FPDM alternative” (your response to Question #9) in relieving your company of “do-it-yourself” costs (your response to Question #7).

The “FPDM alternative” would have been:

0	1	2	3	4	5	6	7	8	9	10
<i>Completely Ineffective</i>										<i>Equally Effective</i>

12. In 2001 FPDM 2.0 was released. On the 7-point scale provided, assess the extent to which FPDM 2.0 achieved the attributes of a high-quality standard relative to FPDM 1.0.

(1 = full realization of the attribute; 7 = realization of the attribute is insignificant)

Attribute	1	2	3	4	5	6	7
Reproducible	1	2	3	4	5	6	7
Robust	1	2	3	4	5	6	7
Unambiguous	1	2	3	4	5	6	7
Extensible	1	2	3	4	5	6	7
Distinct	1	2	3	4	5	6	7
Honest	1	2	3	4	5	6	7
Accommodating	1	2	3	4	5	6	7
Accessible	1	2	3	4	5	6	7
Simple	1	2	3	4	5	6	7
Meaningful	1	2	3	4	5	6	7
	Full Realization						Insignificant Realization

13. For the period 1998-2001 estimate the average annual number of hours expended by your company (and, in parenthesis, its suppliers and buyers) in “do-it-yourself” solutions to problems and issues not addressed in FPDM 1.0 but for which FPDM 2.0 did provide solutions. (If your company first adopted the FPDM standard in 2001 — indicted in your response to Question #4 — estimate the average annual number of hours expended in “do-it-yourself” solutions prior to your adoption of FPDM 2.0.)

	1998	1999	2000	2001
Average Annual Hours	()	()	()	()

Please provide some typical examples of the types of problems and issues you have in mind in your response to Question #13.

14. For the period 2001-2007 please estimate the average annual number of hours expended by your company (and, in parenthesis, its suppliers and buyers) in

solutions to display measurement problems and issues not addressed in FPDM 2.0, and for which “do-it-yourself” approaches are still required.

	2001	2002	2003	2004	2005	2006	2007
Average Annual Hours	()	()	()	()	()	()	()

Please provide some typical examples of the types of problems and issues you have in mind in your response to Question #14.

15. In the process of supporting the FPDM workgroup, NIST personnel developed measurement technology that was transferred to industry. In the table below, please indicate the year your company adopted any of the following technologies; estimate the hours expended in adapting the technology for use (“pull costs”); estimate the hours it would have taken your company to develop this technology on its own; or estimate the costs (in 2010 dollars) of paying for the development of technology by a commercial vendor.

Indicate Year of Technology Adoption	Measurement Technology	Adoption Costs (Hours Expended)	Internal Development Cost (Internal Hours Required)	Commercial Purchase Cost (In 2010 dollars)
----	Stray-Light Frustum			
----	Stray-Light Elimination Tube (SLET)			
----	Sampling Sphere			
----	Test Patterns			
----	Other: (Specify) _____ _____			

16. In the process of supporting the FPDM workgroup, NIST personnel developed education and training workshops that utilized the FPDM as basic

instructional material. Please identify an alternative source of training of comparable quality (e.g., internal, university, other); estimate the hours that an employee would expend in comparable training; and estimate the cost (in 2010 dollars) of such a course.

Alternative source of comparable training: _____

Total hours employees would expend in comparable training: _____

Cost of fees/tuition (in 2010 dollars) for comparable training: _____

Benefits of NIST Participation in the FPDM workgroup

17a. Given the quality of the FPDM as it exist (as assessed in your response to Question #10 and #12), estimate the average annual number of hours your company employees or consultants would have dedicated to the FPDM workgroup, by year, 1992-2007, had NIST not participated in the effort.

	1992	1993	1994	1995	1996	1997	1998	1999
Average Annual Hours								
	2000	2001	2002	2003	2004	2004	2006	2007
Average Annual Hours								

17b. Given the quality of the FPDM (as assessed in your response to Question #10 and #12), estimate the years that FPDM 1.0 (1998) and FPDM 2.0 (2001) would have been released, if NIST had not participated in the effort and the average annual number of hours your company employees or consultants dedicated to the FPDM workgroup remained the same as estimate provided in your response to Question #5.

“Absent NIST” FPDM 1.0 release year: _ _ _ _

“Absent NIST” FPDM 2.0 release year: _ _ _ _

Survey Part II

Downstream Benefits

The following questions will allow analysts to estimate “downstream” benefits; benefits from FPDM implementation that accrue to your customers’ customers due to variations in customers’ “willingness to pay.” These questions are more abstract than the preceding questions. We ask that you provide the best possible estimate that your seasoned judgment allows. Where dollar (\$) estimates are requested, if these are beyond your comfort level, please provide a name and

contact information of a company contact that you feel would be more confident in making such an estimate. Also feel free to contact us to ask for clarification.

Sales of FPDM-related Products and Services

18. If this were a typical or normal year for your company's annual sales of products and services for which FPDM is relevant, what would be the dollar amount (in 2010 dollars) of expected sales? If it would be helpful to formulate an answer, your might begin thinking about a range for sales, and then, for expected sales, give the best estimate within the range for the sales.

Annual sales range of products and services for which FPDM is relevant:
\$ _____ to \$ _____. Best estimate: \$ _____.

19. Annual sales, of course, may be less or greater than the expected sales reported in *Question # 17*. What is the probability that actual annual sales for the typical year will be greater than 125% of the expected sales reported in *Question # 17*? (For example, if expected sales is \$100 million, then what is the probability that actual sales would exceed \$125 million?)

< 20% 21%-40% 41%-60% 61%-80% 81%-100%

20. Continuing to think about the typical or normal expected annual sales of products and services for which FPDM is relevant, do you anticipate a growth trend for the typical or normal annual sales over the next decade? Please indicate:

YES NO

If YES, what is the expected annual growth rate? _____%

If it would be helpful to formulate an answer, your might begin thinking about a range for the annual growth rate—say from 2% to 8%—and then, for the expected rate, give the best estimate within the range—say 5%.

21. For the typical or normal year, for your company's sales of products and services for which FPDM is relevant, in your estimation what is the ratio of earnings before interest and taxes (EBIT) to sales? Please indicate what in your opinion is the best answer below for EBIT/Sales:

< 10% 11%-20% 21%-30% 31%-40% 41%-50%
 51%-60% 61%-70% 71%-80% 81%-90% 91%-100%

Absent FPDM and No Alternative

Continuing to think about the typical or normal year for your company's operations that are affected by FPDM, imagine that there was no standard—that is, FPDM never existed and there was no alternative to FPDM in its place. Think about how that would affect your company's research and development (R&D) and the costs of R&D and also the quality of your product and hence the price you can charge, how it would affect your company's production and process control and hence your production costs, and how it would affect the commercial potential for your products and hence the price you can charge and the extent of your market. Then, answer the following questions.

Again, in answering these questions, we would like for you to abstract from the current economic conditions and think about what would currently be a typical year for your company—an average year during normal times for the economy.

22. If this year was a typical or normal year, and there was no standard—that is, FPDM never existed and there was no alternative standard in its place — for your company's annual sales of products and services for which FPDM is relevant, what would be the dollar amount (in 2010 dollars) of expected sales? If it would be helpful to formulate an answer, your might begin thinking about a range for sales, and then, for expected sales, give the best estimate within the range for the sales.

Annual sales range of products and services for which FPDM is relevant, absent FPDM:

\$ _____ to \$ _____. Best estimate: \$ _____.

23. Annual sales, of course, may be less or greater than the expected sales reported in question (5). From the ranges below, assuming there was no standard — that is, FPDM never existed and there was no alternative standard in its place — for your company's annual sales of products and services for which FPDM is relevant, please indicate the answer that in your estimation gives the best answer to the question:

What is the probability that actual annual sales for the typical year will be greater than 125% of the expected sales reported in question (5)? (For example, if expected sales is \$100 million, ten what is the probability that actual sales would exceed \$125 million?)

< 20% 21%-40% 41%-60% 61%-80% 81%-100

24. Continuing to think about the typical or normal expected annual sales for your company's products and services for which FPDM is relevant, assuming there was no standard — that is, FPDM never existed and there was no alternative standard in its place — do you anticipate a growth trend for the typical or normal annual sales over the next decade? Please indicate:

YES NO

If YES, what is the expected annual growth rate? _____%

If it would be helpful to formulate an answer, you might begin thinking about a range for the annual growth rate—say from 2% to 8%—and then, for the expected rate, give the best estimate within the range—say 5%.

25. For the typical or normal year, for your company’s sales of products and services for which FPDM is relevant, *assuming there was no standard — that is, FPDM never existed and there was no alternative standard in its place — in your estimation what is the ratio of earnings before interest and taxes (EBIT) to sales? Please indicate what in your opinion is the best answer below for EBIT/Sales:*

- < 10% 11%-20% 21%-30% 31%-40% 41%-50%
- 51%-60% 61%-70% 71%-80% 81%-90% 91%-100%

Absent FPDM with FPDM Alternative

Continuing to think about the typical or normal year for your company’s operations for which FPDM is relevant, imagine that FPDM did not exist but the next best alternative took the place of FPDM (as imagined in your response to Survey Part I, Question #9). Think about how that would affect your company’s research and development (R&D) and the costs of R&D and also the quality of your product and hence the price you can charge, how it would affect your company’s production and process control and hence your production costs, and how it would affect the commercial potential for your products and hence the price you can charge and the extent of your market. Then, answer the following questions.

26. If this year was a typical or normal year, and FPDM did not exist but the next best alternative took the place of FPDM (as imagined in your response to Survey Part I, Question #9), for your company’s annual sales of products and services for which FPDM is relevant, what would be the dollar amount (in 2010 dollars) of expected sales? If it would be helpful to formulate an answer, you might begin thinking about a range for sales, and then, for expected sales, give the best estimate within the range for the sales.

Annual sales range of products and services for which FPDM is relevant, absent FPDM:

\$ _____ to \$ _____. Best estimate: \$ _____.

27. Annual sales, of course, may be less or greater than the expected sales reported in Question #26. From the ranges below, and FPDM did not exist but the next best alternative took the place of FPDM (as imagined in your response to Survey Part I, Question #9), for your company's annual sales of products and services for which FPDM is relevant, please indicate the answer that in your estimation gives the best answer to the question:

What is the probability that actual annual sales for the typical year will be greater than 125% of the expected sales reported in question (5)? (For example, if expected sales is \$100 million, ten what is the probability that actual sales would exceed \$125 million?)

< 20% 21%-40% 41%-60% 61%-80% 81%-100

28. Continuing to think about the typical or normal expected annual sales for your company's products and services for which FPDM is relevant, *assuming there was no standard — that is, FPDM never existed and there was no alternative standard in its place* — do you anticipate a growth trend for the typical or normal annual sales over the next decade? Please indicate:

YES NO

If YES, what is the expected annual growth rate? _____%

If it would be helpful to formulate an answer, your might begin thinking about a range for the annual growth rate—say from 2% to 8%—and then, for the expected rate, give the best estimate within the range—say 5%.

29. For the typical or normal year, for your company's sales of products and services for which FPDM is relevant, assuming FPDM did not exist but the next best alternative took the place of FPDM (as imagined in your response to Survey Part I, Question #9), in your estimation what is the ratio of earnings before interest and taxes (EBIT) to sales? Please indicate what in your opinion is the best answer below for EBIT/Sales:

< 10% 11%-20% 21%-30% 31%-40% 41%-50%
 51%-60% 61%-70% 71%-80% 81%-90% 91%-100%

Willingness to Pay

This final set of questions is, we think, the most difficult, but we would be interested in your best assessment of the answers. Imagine a typical customer of products and services for which FPDM is relevant. For the price of your product, there will be customers who

would not buy at a higher price. But, given the actual price, chosen for strategic reasons in the context of competition, most customers are paying less than they would be willing to pay. *For the typical customer (with a willingness to pay a price higher than the actual price of your product or service), what is the ratio to the actual price of your product of what that typical customer would be willing to pay for your product in each of the three scenarios above?* For example, if the actual price is \$100, and the typical customer would be willing to pay \$150, then the ratio is 1.5.

Please indicate what in your opinion is the best answer for each of the following scenarios:

30a. Given FPDM, the ratio of the price the typical customer would be willing to pay to the actual price of your product (willing-to-pay/actual) is:

1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 > 2

30b. Assuming there was no measurement standard —that is, *FPDM never existed and there was no alternative standard in its place* — the ratio of the price the typical customer would be willing to pay to the actual price of your product (willing-to-pay/actual) is:

1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 > 2

30c. Assuming FPDM did not exist but the next best alternative took the place of FPDM — as imagined in your response to Survey Part I, Question #9 — the ratio of the price the typical customer would be willing to pay to the actual price of your product (willing-to-pay/actual) is:

1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 > 2

Thank you for taking the time to provide your best estimates for the answers to the questions.

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