

June 11, 2007

Advisory Committee
Measuring Innovation in the 21st Century Economy
c/o Elizabeth (E.R.) Anderson
Deputy Under Secretary for Economic Affairs
U.S. Department of Commerce
1401 Constitution Avenue
Washington, DC 20230

Re: Request for Comment: Measuring Innovation in the 21st Century Economy

Dear Advisory Committee on Measuring Innovation in the 21st Century Economy:

This letter and the enclosed document provide the Institute for Triple Helix Innovation's perspective on the optimal innovation framework for the 21st Century and comments on the four topical areas that are presented in the April 13, 2007, *Federal Register* notice on Innovation Measurement.

The Institute is a Federally-funded Hawaii-based non-profit corporation with a Congressional mandate to facilitate regional, national and international systems for collaborative innovation through a robust and enduring program of cross-cutting Research and Development (R&D). The Institute's current research includes the validation of cross-sector, interdisciplinary methodologies for collaboration and innovation; the development of novel information and communications technology (ICT); and, the creation of distributed networks that leverage human and material resources with integrated solutions. The Institute functions as a national arbiter of trilateral (academia, industry, and government) innovation best practices and of collaborative innovation methodologies, with a mission: "To enable the nation to realize its collaborative potential for economic growth, efficiency, and innovation." Over time, the wealth of knowledge accumulated through Institute endeavors will accelerate the transmission of new technologies from idea to market and create more efficient mechanisms for translating empirical data into usable products and processes.

The Institute applauds Secretary of Commerce Carlos M. Gutierrez's decision to initiate this effort to explore innovation in the 21st century, and the work of the Advisory Committee on Measuring Innovation in the 21st Century Economy. We submit these comments to inform the Advisory Committee of our ongoing work and to offer what we hope will be useful insights concerning efforts to research innovation.

We invite the Advisory committee to contact the Institute, should the need arise, as it proceeds with its work.

Sincerely,

/s/ LEIGH W. JEROME

Leigh W. Jerome, Ph.D.
Director

Enclosure

**Comments For:
The Advisory Committee on Measuring Innovation in the 21st Century Economy**

The Triple Helix Innovation Perspective

The Institute for Triple Helix Innovation (hereafter, the Institute) holds the following broad perspective on the optimal framework for innovation. We believe that innovation requires more than the emergence of a good idea or a promising prototype. Bringing the benefits of new technology, new products, new processes, and new knowledge to the market is a key challenge for an innovation system. While there is an abundance of available data, there is often an absence of knowledge creation, or a deficit in our ability to apply knowledge meaningfully (United Nations Department of Economic and Social Affairs, 2003). The efficacy of new developments must be substantiated through empirical research and then pushed out as a product or as codified knowledge, within a societal context.

Mounting evidence confirms that controlled collaboration of academia, industry, and government facilitates innovation and creative development while providing balance between the pursuit of focused knowledge, social benefit, and profit motivations. Increasingly, innovation is considered to be an event that occurs at the organizational level where knowledge can be quickly generated and diffused. Today's innovations tend to be the result of persistent, interdisciplinary, collaborative approaches to research (Best et al., 2003). Moreover, a triple helix of overlapping spheres of academia-industry-government is increasingly at the core, rather than the periphery, of regional, national and multinational innovation systems (Etzkowitz, 2003).

Shapira (2002) cites three compelling reasons to establish flexible partnerships with academia-industry-government networked infrastructures: Social benefit, economic efficiency, and sustainability. Trilateral collaborations energize partners to address local and national concerns through funded research programs. Partnerships can thus leverage human and material resources to generate novel solutions while furthering the acquisition of new knowledge. Partnerships can, therefore, significantly facilitate knowledge spillover and the transfer of scientific knowledge to tangible product development. Removing barriers to co-operation, supporting collaborations, and facilitating the exchange of science and technology personnel influences the orientation of research efforts toward societal needs, and enhances cooperation among international science and technology organizations.

Emerging literature that reviews university-industry-government networked infrastructures supports triple-helix collaborations as the key to improving the conditions for innovation in a knowledge-based society include Shapira (2002), Campbell (2005), Leydesdorff (2003), Etzkowitz (2002), and Sutz (1998). Triple helix research partnerships are considered the best promise for establishing long-term organizational

structures that allow for short-term intensive collaborative experiences (Campbell, 2005; Etzkowitz, 2003; Langford et al., 2005; and Leydesdorff and Fritsch, 2005).

Given this perspective on the optimal framework for engendering innovative outcomes, the Institute provides the following comments on the four topical areas set forth in the April 13, 2007, *Federal Register* notice on “Innovation Measurement.”

Comments on Topical Areas

- I. Improvement of the underlying architecture of the U.S. System of National Accounts to facilitate development of improved and more granular measures of innovation and productivity.

Economic growth represents a key factor in the current urgency to measure innovation. Numerous econometric approaches have been employed historically to identify innovations’ contribution to economic growth. For the many reasons that have been, or will be entertained by the Advisory Committee on Measuring Innovation in the 21st Century Economy, the current consensus is that existing techniques and data resources are inadequate to produce perfect measures of this contribution. Early on, Griliches (1992) argued long and hard concerning the difficulty in using econometric techniques to identify innovations’ contributions to growth in innovating, near, and far industries.

The Institute supports econometric efforts to measure innovations’ contributions to growth. Similarly, we recommend that work be continued in the implementation of traditional efforts for improving underlying quantity and price data. However, we suggest that the Advisory Committee entertain the following considerations for expanding our National perspective:

1. A conservative approach to the initiation of large new data collection efforts may be favorable until there is a clear evidence base for how to accurately define and measure innovation; i.e., until a comprehensive and integrated theoretical framework for innovation is developed. A key issue here is that the economy is changing rapidly and it creates important valuation issues for new products and services. For example, measurement and valuation of the output and time and material resource inputs that are associated with “Second Life” on the Internet are only tangentially related to measures that are used for the traditional economy products and services. New source data would be of greater value if collected when their varied uses are crystal clear.
2. Given the foregoing, it may be prudent to simply continue improving current source data that are used for national account measures without expanding them considerably.
3. It appears appropriate to develop broad and focused measures of the growth in innovation using composite indexes. In this regard, we suggest using a technique that is currently being developed at the Institute, which

employs exploratory principal factor analysis to identify key contributors to the growth in innovation using a large swatch of currently available time series. As a starting point, input series for this exploratory principal factor analysis may be drawn from current, ongoing efforts to compile indicators of innovation in the United States or from efforts by other nations to identify such indicators; e.g., the European Community “Innovation Scorecard” (see Sajeve et al., 2005).

- II. Identification of appropriate economy-wide and sector-specific statistical series or other indicators that could be used to quantify innovation and/or its impact.

Reference Part I.3 above, the Institute for Triple Helix Innovation supports sources that reflect indicators of innovation. However, we reiterate the need for care in organizing/compiling these data so that they shed accurate light on past, current, and future growth of innovation. We also counsel that the Advisory Committee entertain a full range of indicators that may be causally correlated with innovation. Such indicators go beyond the economic and technological to include demographic measures and sustainability factors. The Institute has collected, and will continue to collect, a broad range of data series that we believe are correlated with innovation growth. (See information about the Institute’s MegaTrend Data Analysis at <http://www.triplehelixinstitute.org/projectInfo/dataAnalysis.html>.)

- III. Identification of firm-specific data items that could enable comparisons and aggregation.

From a policy-making perspective, the Institute believes that innovation should be facilitated and fostered so that overall economic well-being is best enhanced whilst measurement is a secondary consideration. Consequently, a primary Advisory Committee task should be to recognize measurement related approaches that stimulate innovation. In this regard, the Institute has a suggestion under this topical area.

Notwithstanding our comments under Part I, we suggest that a strong effort be made to begin the collection of firm-specific information on new products/services that become available in the economy. To our knowledge, there is no ongoing and comprehensive list of products/services that are being categorized in the economy. We believe that this represents an important shortcoming for the following reasons:

1. A key stimulus to innovation is research and development (R&D).
2. Willingness to invest in R&D is a decreasing function of uncertainty, which is associated with the direct and indirect (externalities/spillover) returns to R&D (Coase, 1960).
3. Given the just-mentioned uncertainty, prospective R&D investors are uncertain concerning how to position themselves to capture spillovers if they were identifiable.

4. Items 1-3 limit R&D investment and, thereby, innovation.

The Institute believes that the above described shortcoming should be eliminated, thereby producing the following favorable result. A complete “genoming” (in this case “prodnoming”) of existing and newly available products/services in the economy, along with an appropriate information technology system, could help reduce uncertainty about returns to R&D. A database with properly catalogued and specified products could inform R&D investors about the role that newly designed and produced products/services might play in the economy: i.e., what products/services would be displaced; and what new combinations of products/services might form as a result of existing and newly available products/services. A “mapping” of all products/services in the economy might also reveal previously unrecognized product/service holes, which could stimulate new R&D and entrepreneurship. Such a system could also help shape the strategies of R&D investors in identifying industries and firms that would benefit from a newly created product/service, and help inform decisions concerning efforts to capture such benefits by acquisitions or investments. If such a system could reduce uncertainty about returns to R&D, then R&D and innovation could be increased.

Therefore, we recommend that the Advisory Committee consider the need for a complete, firm-specific product list—appropriately catalogued and fully specified.

IV. Identification of specific “holes” in the current data collection system that limit our ability to measure innovation.

The discussion presented in Part III denotes missing source data; but the data gap is associated more with stimulating, rather than measuring, innovation. But, in fact, the “prodnoming” of products/services does yield an innovation metric—“new products produced in a period.” This gap should be filled.

The human capital that drives innovation warrants further study. Research efforts at the Institute reveal that there are at least three very important deficits in the nation’s data collection program. First, to our knowledge, although the nation has very good statistics on the completion of formal education, it lacks good data on certain aspects of “life-long learning.” If human capital formation is motivated by returns, then there must be considerable returns to the human capital that is formed through semi-formal and informal training. We need more information about the quantities and prices that are associated with investment in human capital by life-long learners. The Bureau of Labor Statistics’ Time Use Survey may offer an opportunity develop measures in this area. Second, and a related concern, is the nation’s lack of information about language capacity. Immigration and formal and informal training enable U.S. citizens to possess language facility beyond English. These language skills are valuable. They enable a broadening of social networks, which often yield innovative outcomes when individuals serve as bridges across structural holes in diverse social networks (Burt, 2000). The Institute believes that full comprehension and measurement of innovation cannot be achieved without greater knowledge and data on the human capital that stokes the

innovation process in the nation. Therefore, we urge the Advisory Committee to consider recommending the expansion of data collection in these two human capital formation areas.

Third, certain evidence indicates that collaborative interactions by scientists and researchers facilitate and enhance prospects for innovation—especially when those interactions transpire via cutting-edge information technology tools in a distributed environment. Consequently, the Advisory Committee should consider the need for data that will permit a thorough analysis and codification of this mechanism.

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