

**DEPARTMENT OF COMMERCE**  
Economics and Statistics  
Administration  
Innovation Measurement

SUMMARY: The Department of Commerce is seeking public comment on issues related to the measurement of innovation. This request supports efforts of the Measuring Innovation in the 21<sup>st</sup> Century Economy Advisory Committee as it prepares recommendations for the Secretary of Commerce on new or improved measures of business innovation.

The committee is charged with developing innovation metrics that inform policy decisions and enable policymakers and the business community to better monitor innovation. Among other things, the Committee's work should build on the way firms assess the effectiveness of their own innovative activities. The recommendations should not only focus on measuring innovation and inputs, but should also focus on the results and output of innovation. Furthermore, the recommendations

should allow for analysis at industry, sector, national, and international levels and will cover the following four major categories

*1. 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.* Our national accounts are the main source of information about the growth of our national output, usually measured by the gross domestic product or GDP. Total Factor productivity (TFP), which measures growth of output per unit of input for the economy as a whole and for individual industries, is not included in the national accounts. Is the concept of TFP sufficiently related to innovation to warrant the inclusion of economy-wide and industry level TGP in the system of national accounts? <sup>(1)</sup>. If so, what is the most effective way to incorporate the concept into national accounts? <sup>(2)</sup>. Are there ways to disaggregate the innovation component of TFP to differentiate innovation from other productivity

drivers? <sup>(3)</sup>.

*2. Identification of appropriate economy-wide and sector-specific indicators that could be used to quantify innovation and, or, its impacts.* Are there measures that accommodate economy-wide (or macro-economic) and sector-specific notions of innovation? <sup>(4)</sup>. What elements of innovation could serve as a foundation for statistical series? <sup>(5)</sup>. To what extent would the collection of better data on service sector outputs and service inputs used by all firms improve innovation measurement? <sup>(6)</sup>. Is market share growth a good indicator of innovation? <sup>(7)</sup>. If so, would estimates in the change in U.S. firms' shares of regional, national, and global markets be useful innovation measures? <sup>(8)</sup>. Could, or should, collaborative connections between entities be captured? <sup>(9)</sup>. Since a characteristic of markets is that the benefits of innovations flow, at least in part, to buyers, are there ways to identify the flow of innovations across ►

In 2007 the Department of Commerce published twenty four questions (in four groups) in the Federal Register (above and overleaf) for its Measuring Innovation in the 21<sup>st</sup> Century Economy Advisory Committee, but its final report in January 2008 left them unanswered. By focusing on formal knowledge they missed tacit commercial sources that, when codified, can provide answers - as the following annotations briefly indicate

<sup>(1)</sup> The best way to tell if TFP captures innovation is by comparing it to an independent measurement. Economics is crippled in this because of its 'quality change problem': no analytical method for enumerating how good a good or service is. Since innovative activity is constantly trying to better the quality of goods and services this is a huge impediment for making progress on the economics of innovation. By exploring forgotten byways of economics - two of them hinted at by Joseph Schumpeter in the 1940's - but left unanalyzed in Economics, commercial knowledge now has its own solution, which solves the quality change problem.

<sup>(2)</sup> Two things appear to have been missed by the TFP concept as a measure of innovation in GDP (1) when independently enumerated, innovation always **exceeds** TFP (2) the quality change problem <sup>(1)</sup> introduces biases due to innovation (as established by the Stigler & Boskin Commissions). And it is not rigorous to connect GDP with innovation if biased by it. Because the independent method eliminates bias, it overcomes this.

<sup>(3)</sup> There can be no innovation component of TFP, if the whole of TFP is too small to capture innovation. TFP must be measuring something else.

<sup>(4)</sup> Yes. The new methods contain rules for aggregating innovation at industry, sector and economy levels.

<sup>(5)</sup> A database dubbed DINTEC™ was used to validate the new elements of innovation. A subset of its content defines what data needs to be collected to enumerate innovation.

<sup>(6)</sup> DINTEC™ contains some data for the service sector. More importantly it defines what needs to be harvested that currently isn't.

<sup>(7)</sup> A firm can grow its market share by taking over competitors with similar products. Therefore market share growth is not necessarily a measure of innovation. However should the combination reduce costs or allow the extra revenue to better enable the combined firm to innovate for the future, **p/c** will measure it - see <sup>(10)</sup>

<sup>(8)</sup> No. See <sup>(7)</sup>. <sup>(9)</sup> No. This data is not part of DINTEC™

firms and sectors? <sup>(10)</sup>

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

Current corporate innovation measurement appears to be done primarily on either a project or portfolio basis. Are these measurement practices sufficiently widespread and uniform to make data collection on either of these bases practical? <sup>(11)</sup> Is it possible or necessary to collect information on company culture, incentive structures, and organizational change? <sup>(12)</sup> If customer satisfaction is an important measure of an innovative firm, how can that be captured? <sup>(13)</sup> How important is it to distinguish between types of innovation (i.e. radical versus incremental)? <sup>(14)</sup> What data would be needed to differentiate the characteristics of innovative firms within industry sectors from non-innovative firms? <sup>(15)</sup> What are the most important measures of the underlying process of how

innovation and productivity advances are initiated or stimulated? <sup>(16)</sup> Could or should an understanding of innovation from the consumer perspective be developed? <sup>(17)</sup> Could data items from SEC filings be used to enhance understanding of innovation in public companies? <sup>(18)</sup> Are there proxies for relative innovative success (e.g. percent of total revenue attributable to new – or significantly improved to the point where they could be considered new – products, services, or processes introduced within the last five years into markets where a firm has a growing market share) that would provide insight into relative innovative strength? <sup>(19)</sup> Is two years long enough? <sup>(20)</sup>

*4. Identification of specific ‘holes’ in the current data collection system that limit our ability to measure innovation.* Some specific types of data holes were identified during the meeting, including lack

of data on firm formation, intellectual property licensing costs as a type of purchased input, and insufficient product detail. What should be the prioritized list of specific data items needed to fill the holes? <sup>(21)</sup> Limitations on our ability to link and coordinate across various data sets were also mentioned as a hole or deficiency of our current data collection system. Are there cost-effective ways of building on existing data sets to develop more information on innovation drivers and their link to success? <sup>(22)</sup> How could data sharing and cooperation among federal agencies be improved insofar as such agencies maintain data series related to the measurement of innovation? <sup>(23)</sup> Could existing private and, or, foreign data be combined with existing official statistical series in order to better measure innovation? <sup>(24)</sup> Are there changes that could be made to make such combinations possible or easier? <sup>(24)</sup>

<sup>(10)</sup> The way to look at this is that the benefits of innovations are twofold. One, cost of delivery, benefits the firm to the extent that it allows profit to be made Two, performance of the product or service benefits the buyer. And it is the perception of that benefit (not its engineering characteristics) by the user that determines this. Innovation is therefore completely enumerated by  $p/c$ , where  $p$  is the performance of the product or service as perceived by the purchaser and  $c$  is the unit cost of delivery by the provider.

<sup>(11)</sup>  $p/c$  is calculated on an individual product or service basis. However it can be aggregated to portfolio and that is useful when portfolios are the basis of competition.

<sup>(12)</sup> Not necessary. They are a subset of the means for delivering  $p/c$  but are not part of DINTEC™

<sup>(13)</sup> Customer satisfaction is captured by the numerator  $p$  of  $p/c$

<sup>(14)</sup> Not important as such because the effect is already captured by the difference between  $p/c$  and a baseline. Radical innovations will generate greater gaps than incremental ones – with a more disruptive market outcome. This is an area pregnant with future research possibilities.

<sup>(15)</sup> This is achieved by comparing  $(p-p')/c$ , where  $p'$  is the performance delivered from a given firm’s supply chain.

<sup>(16)</sup> Innovation is driven by competition. Therefore competition must be measured before innovation can be. The ability to do that is an essential part of the new methodology.

<sup>(17)</sup> This perspective is implicit in  $p$ , and is calculated from economic and market data.

<sup>(18)</sup> Yes. DINTEC™ makes extensive use of SEC data.

<sup>(19)</sup> Relative innovative strength is measured by  $(p-p')/c$ . All others are proxies for that.

<sup>(20)</sup> The historical trend of  $(p-p')/c$ , when plotted against development spending reveals the firm’s underlying innovation productivity (in the slope of this graph). At least five years of data are generally needed.

<sup>(21)</sup> A prioritized list can be developed from the success of subsets of DINTEC™ in measuring innovation.

<sup>(22)</sup> DINTEC™ is based on existing but disparate data sources. There is enormous potential for rationalizing them.

<sup>(23)</sup> See <sup>(22)</sup>

<sup>(24)</sup> and <sup>(24)</sup> Yes and yes. Again this is part of what is offered within DINTEC™.

These answers stem from original knowledge, described in Working Paper No. 5 from [www.techmatt.com](http://www.techmatt.com)