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# Sector Paper On Computer Programming, Consultancy and Related Activities (ISIC rev. 4 draft Sector 62)

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Foreword

The objectives of the sector papers is to present a synthesis of the state of the art on the methodology and practices in developing classification, production (turnover) and price statistics for service industries and commodities. The papers are based on individual country's experience as they were reported through a series of mini-presentation, as well as the results of the discussions during the various meeting of the Voorburg Group.

The purpose of this series of sector papers is not to replicate what is already presented in the mini-presentation reports, nor to rehash general issues regarding the needs of service statistics of the national accountants or the general methodology framework for the establishment of price and turnover statistics. These issues are described in another series of paper that will be available on the Website of the Voorburg Goup[1].

The value added of the sector paper is that it provides, to countries that are starting the development of new services statistics, a framework that allows them to identify different practices and opportunity costs that are derived from the experience of others. As such the paper gives indication that help a country in deciding whether given its institutional conditions it can afford to use one method over another.

This sector paper on *Computer programming, consultancy and related activities* is the first attempt of highlighting the characteristics and opportunity cost of the various experiences that were presented at the Voorburg meeting of Seoul in 2007. Given that this is a new initiative, it is still seen as work in progress and hopefully it will achieve the goal of gathering in an organized way the key characteristics on the wealth of knowledge that already exist on the development of service statistics so that it can be instrumental to further advance the development of service statistics.

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[1] Two papers will be presented at the Voorburg meeting in Aguascalientes (Sept 2009) for their adoption. The first one describes the needs of the National Accounts for Service statistics, while the second one presents general methodology aspects of services statistics. In addition, to these two general papers, the Voorburg Group has been documenting with examples the General Thesaurus adopted by the OECD and Eurostat on pricing methodologies.

## 1.0 Introduction

This sector paper on Computer Programming, Consultancy and Related Activities provides a summary of international progress and challenges in the measurement of turnover and price change. In addition this paper will provide an overview of current and proposed classification structures.

The sources of information include but are not limited to the presentations and summary notes from the *22nd* (2007) *Voorburg Group Meeting on Services Statistics,* Seoul, South Korea. Papers on turnover statistics were presented by France, the United States and the Netherlands and another series of presentations on prices were given by France, Korea, and the Netherlands.

The paper is organized as follows. After the introduction, section (2.0) covers some of the primary issues related to the classifications of service industries and commodities. Section (3.0) provides basic turnover statistics, describes turnover measurement issues and addresses the turnover collection practices of several countries. Section (4.0) presents the methodological price collection options chosen by several countries and concludes with a general discussion of price measurement issues and challenges.

## 2.0 Classifications

Computer services can be thought of as a subset of IT services and for the purpose of this review are encompassed by the International Standard Classification of All Economic Activities (ISIC) Division 62 – *Computer Programming, Consultancy and Related Activities*. ISIC Division 62 is an aggregation composed of three industries that are described in section 2.1. Note that all subsequent reference to ISIC in this paper will refer to the proposed ISIC Rev 4.[2]

The North American Industry Classification System (NAICS) v 2007 is used by the U.S., Canada and Mexico. The NAICS industry code 54151- *Computer System Design and Related Services,* an aggregation composed of four industries is comparable to ISIC Division 62.

In addition, countries within the European Union use a somewhat more detailed industry classification structure (relative to ISIC) based on NACE (Nomenclature statistique des activities economiques dans la Communaute Europeenne) which will be updated from its current Rev 1.1 to Rev 2.0 in the 2008-2009 period. A positive result for the classification update is that NACE Rev 2.0 and ISIC Rev 4.0 use similar numeric codes and industry descriptions for Computer Programming, Consultancy and Related Activities.

## 2.1 Industry Classification

**ISIC Division 62 Industries**

- 6201-Computer Programming Activities
- 6202-Computer Consultancy and Computer Facilities Activities
- 6209-Other Information Technology Services

[2] Details of ISIC Rev 4, including codes, industry titles and descriptions were obtained from the UN web site; www.unstats.un.org.

**NAICS Group 54151 Industries**

- 541511-Custom Computer Programming Services
- 541512-Computer System Design Services
- 541513-Computer Facilities Management Services
- 541519-Other Computer Related Services

**NACE v2.0 Division 62.0 Industries**

- 62.01-Computer Programming Activities
- 62.02-Information Technology Consultancy Activities
- 62.03-Computer Facilities Management Activities
- 62.09-Other Information Technology Service Activities

The industry details listed above show that all three classification systems are similar, but both NACE and NAICS specify Computer Facilities Management Services as a separate industry, while ISIC combines this business activity with Computer Consultancy.

In general the proposed classification structure for NACE and ISIC appear to offer a more transparent and useful delineation between computer services industries for the national accounts and SPPIs. On the other hand, most countries have not yet adopted the new classification structure so the conformance of the proposed structure with real world data collection experience remains to be determined.

At last years VG meeting, results were presented from a survey of 23 countries on progress in developing turnover and price statistics for computer services industries.[3] Usable responses were obtained from 18 countries. Each country was asked to provide information on the level of industry and product data and to also provide information on the alignment of their turnover and price data. Several interesting facts were revealed in the survey as to the current progress in estimating turnover statistics. For instance, of the 18 countries responding, 12 (66%) collect turnover data for ISICs 6201 and 6209 and 13 (72%) collect turnover data for ISIC 6202.[4] However, only 4 (22%) countries produce turnover detail equal to or greater than CPC (Central Product Classification) detail for ISICs 6201 and 6209 and just 5 countries (27%) produce turnover detail equal to or greater than CPC for ISIC 6202. Additional results from the survey are shown in Appendix 1.

It has become something of a truism that measuring economic statistics is often more difficult for services compared to goods. *Computer Programming, Consultancy and Related Activities* helps keep the truism alive and well. To better understand some of the measurement challenges, it may be helpful to first take a more detailed look at the types of services offered by ISIC Division 62 establishments.

## 2.2 Industry Detail

Almost all firms use computers and information technology to operate and improve efficiency. However, as IT complexity and demand for highly skilled staff continues to grow, firms are increasingly outsourcing their IT support and implementation needs. Consequently, outsourcing

[3] The survey results were presented by Mark Wallace of the US Census Bureau in a report titled "Voorburg Group Country Progress Report: 2007".

[4] Note that NACE Rev 2.0 breaks ISIC 6202 into two codes; NACE 62.02-Information Technology Consultancy Activities and NACE 62.03- Computer Facility Management Activities.

has become a fundamental driver of growth. As mentioned in the beginning of this section the outputs of ISIC Division 62 are encompassed by three industries which are described in more detail below.

ISIC 6201 – *Computer Programming* can be thought of as custom software. Computer programmers write, modify, test, maintain and support software to meet the needs of a particular customer. The service provided may also include customizing packaged software to client's specific needs such as interfacing with other software or business processes. Note that *Software publishing* (aka prepackaged or packaged software which includes licensing the right to use most operating systems, office suites, utilities and games as well as support and software updates) is not part of ISIC Division 62, but instead is included as part of ISIC Division 58 - *Publishing Activities*.[5]

ISIC 6202 - *Computer Consultancy and Computer Facilities Management*, cover a broad array of services. Some of the measurement problems mentioned in last years sector paper on *Management Consultancy* (ISIC 7020), such as "*The services provided by this industry tend to be customized and unique to each client",* also apply to Computer Consultancy.[6] At its most basic, the primary services provided by Computer Consultancy can be described as planning, designing, advising or offering expert opinion on computer systems that integrate hardware, software and communication technologies. Computer consultants may provide the hardware and software components for their design or these components may be provided by 3rd parties. Computer consultants may also install the system and train and support users of the system including providing advice and procedures for enhancing systems security.

This industry also includes *Computer Facilities Management* establishments which provide **on-site** (including remote access) management, operation and support services for client's computer systems and/or data processing facilities. Note that establishments providing computer data processing services at their own facilities are not included in this industry, but instead are part of ISIC Group 631 - *Data processing, hosting and related activities; web portals.*

ISIC 6209 - *Other Information Technology and Computer Service Activities*, include outputs as diverse as computer disaster recovery services, installation (setting-up) of personal computers and software installation.

At this point of the review it is clear that turnover for *Computer Programming, Consultancy and Related Activities* include a wide range of services. Turnover is usually measured in the National Accounts by the value of revenue received by establishments for providing computer services to clients.

### 2.3 Product Classification

Somewhat more descriptive output detail can be found in the proposed CPC v 2.0. However, the new CPC detail continues to be somewhat general considering the heterogeneous mix of services

[5] More specifically, at the industry level, *Software publishing* makes up ISIC 5802. A paper presented by the US at the 2003 VG meeting in Tokyo titled ***Measuring Constant Quality Industry Output Prices for Software Services*** describes the pricing methodology that continues to be used in the US PPI for Prepackaged software.
[6] Benjamin Camus and Mark Wallace, *Sector Paper on Management Consultancy (ISIC sector 7020*), presented at the 22nd meeting of the Voorburg Group, September 2007.

that will be encountered in surveys of ISIC Division 62 establishments. Enhanced product detail is available from the U.S. Census in their North American Product Classification System (NAPCS) initiative for establishments in Computer Programming, Consultancy and Related activities industries. Comparisons of the CPC and NAPCS product details are shown in table 1.

**Table 1. Comparison of CPC Ver.2 and NAPCS Product Detail**

| CPC Code and Subclass Title | NAPCS Code and Census Inquiry Title |
|---|---|
| 83131 IT technical consulting services | 35000 IT technical consulting services |
| 83132 IT technical support services | 35501 Software related technical support services<br>35502 Hardware related technical support services<br>35503 Combined hardware and software support services<br>35504 Auditing and assessing computer operations<br>35505 Data recovery services<br>35506 Disaster recovery services, business continuity services<br>35507 Other IT support services |
| 83141 IT design and development services for applications | 35050 Custom computer application design and development services<br>35051 Web site design and development services<br>35052 Database design and development services<br>35053 Customization and integration of cross-industry application software<br>35054 Customization and integration of vertical market application software<br>35056 Other custom application design and development services |
| 83142 IT design and development for networks and systems | 35101 Computer network security design and development services<br>35102 Computer network design and |

| | |
|---|---|
| | development, except security<br><br>35151 Computer systems design services<br><br>35152 Computer systems design and development services<br><br>35153 Computer systems integration services |
| 83161 Network management services | 35450 Information technology infrastructure and network management services |
| 83161 Computer systems management services | 35450 Information technology infrastructure and network management services |

The detail available in the NAPCS structure provides a more granular view of outputs described as important by US trade associations such as the *Independent Computer Consultants Association* (www.icca.org) and the *National Association of Computer Consultant Businesses* (www.naccb.org).

A recent review of marketing and sales materials from establishments engaged in computer consulting services and computer facilities management revealed that they actively promoted the following service offerings (their terminology is used).

**Establishment A** (primarily facilities management)
• 24/7 computer and network support
• 24/7 server support
• 24/7 network monitoring and network management
• Network design and implementation
• Network security
• Patch management, virus protection and spyware protection
• Online license management
• Backup and recovery
• PC and printer setup
• Unlimited remote and on-site support
• Monthly fixed cost computer and network support
• Built-in disaster recovery (no extra charge)
• On-site within 4 hours or less
• Network engineers who can communicate in Plain English, not techie language

**Establishment B** (primarily facilities management)
• Network and Systems Administration and Support
• Computer and Network Troubleshooting
• Server Health Monitoring
• Data Backup
• Remote Connectivity - Branch Offices and Remote Users
• Server Applications Monitoring
• Anti-Virus
• Spam Filtering Solutions
• Spyware and Malware Removal

• Security Audits and Management
• Disaster Recovery and High Availability Solutions
• IT Asset Management and Change Tracking
• 24x7 Automated Monitoring
• Custom and Flexible Solutions to Meet Your Needs

**Establishment C** (primarily computer consulting)
• Evaluation of current computer and network technologies
• Researching computer hardware / software alternatives specific to the organization
• Computer hardware and application software sourcing
• Network design, implementation, maintenance, and training
• Management of existing networks
• Network cabling
• Software setup
• Computer maintenance
• Internet connectivity installation and support

Establishments A, B and C (above) are all mid to small size and tend to limit their sales to a single regional or metropolitan area. The list of services shows that establishments need not be large to offer a broad and complex array of services.

### 3.0 Turnover Statistics

Surveys or administrative records (regulatory reporting, tax data, trade association statistics and company reports) are the primary sources used to obtain turnover data. Surveys are more costly and introduce additional burden for respondents, but administrative records lack detail and may include revenues that are out of scope for the service category of interest. Whether using surveys or administrative records, annual data is the minimum requirement for economic benchmarks. Higher frequency data require additional resources but enable the calculation of important reports such as quarterly GDP estimates and more timely analysis of economic performance and projections.

France uses an annual survey of business which in addition to turnover by service category, asks for turnover to be identified by the type of client consuming the service (businesses in the same group of companies, other businesses, public bodies or individuals). One of the uses for this level of detail is to identify captive entities. More timely, but less detailed turnover data is obtained from administrative records such as tax declarations. Turnover for imports and exports are obtained from balance of payments data.

Table 2 uses data from the 2005 French Annual Survey of Business to provide estimates of turnover and the relative importance of NACE Division 62.0 industries.

**Table 2. 2005 Industry Revenue (estimates) from the French Annual Survey of Business[7]**

| NACE Rev 2.0 | Revenue (€ billions) | Percent of NACE Division 62 Revenues |
|---|---|---|
| 62.01-Computer programming activities | 3.40 | 10.4%* |
| 62.02-IT consultancy activities | 26.20 | 80.3% |
| 62.03-Computer facilities management activities | 2.90 | 8.9% |
| 62.09-Other IT service activties | 0.10 | 0.3% |

*In the U.S., Computer programming activities accounts for approximately 34 percent of NAICS 54151 (equivalent to ISIC/NACE Division 62) revenues.

Table 2 shows that in France, NACE 62.02- *IT consultancy activities* is by far the most important industry in terms of turnover/revenue within the NACE 62.0 aggregation.

The Netherlands uses annual structural business surveys to obtain a breakdown of turnover which will expand from 2 to 4 digit detail when they switch to NACE v2.0. Quarterly *development* (percent change) estimates are obtained from short term statistics and monthly estimates from business tendency surveys.

The United States uses a five year benchmark economic census and obtains more frequent updates from annual and quarterly surveys. The comprehensive census and less detailed annual and quarterly samples include data from employers while non-employer data is captured in a separate program.[8] The data collected enable the separation of market and captive computer services. Census surveys request information on the type or class of client, but response for this kind of inquiry has been low.

Transparent comparisons of this sector as defined under the proposed ISIC Division 62 will be difficult by country and trend until VG member countries update their classification structures. However, the United States measure of size is relatively transparent and consistent over multiple years because the existing NAICS structure concords well with ISIC rev 4.0 at the industry level. Table 3 provides United States revenue/turnover data for the equivalent of the ISIC Division 62 sector for the years 2000, 2003 and 2006 from which we may be able to more broadly generalize.

**Table 3. Industry Revenue from the U.S. Economic Census**

| NAICS | | 2006 Revenue ($millions) | 2003 Revenue ($millions) | 2000 Revenue ($millions) |
|---|---|---|---|---|
| 54151 | Computer systems design and related services | 200,695 | 171,393 | 186,402 |
| 541511 | Custom computer programming services | 67,986 | 58,140 | 70,004 |
| 541512 | Computer system design services | 90,569 | 76,992 | 82,763 |
| 541513 | Computer facilities management services | 24,077 | 22,518 | 21,816 |
| 541519 | Other computer related services | 16,447 | 13,743 | 11,819 |

The revenue data in Table 3 show that the Computer systems design and related services industry group generated about $200 billion in 2006. This NAICS aggregation is composed of four industries; Custom computer programming, Computer systems design services (Consulting),

[7] Camus, Grac, Salvatori, (2007), *Mini-presentation on turnover/output in France*, pg. 7.
[8] The Service Annual Survey uses a sample to estimate industry and broad product revenue data at the industry group level 5415- *Computer systems design and related services.*

Computer facilities management services and Other computer related services. Approximately 80 percent ($157 billion) of total aggregate revenues were generated by Custom computer programming and Computer consultancy in 2006. As with many IT industries, revenue growth for the sector turned negative from 2001 to 2003. The Custom computer programming industry was especially hard hit, with revenue dropping 17 percent. Since 2003, the four industries that make up the sector have shown positive revenue growth, but this growth has been strongest for Computer systems design services (up 15 percent).

Based on the presentations from last years VG meeting, the declining turnovers shown in table 3 were not unique to the United States but in fact wide-spread, though perhaps the declines were not as sharply felt in other VG countries. The more pronounced declines in the U.S. appear to be partly due to the relative greater importance of the Computer programming industry.

### 3.1 Main Issues with Turnover Measurement

One issue with turnover measurement is about to be significantly resolved. Comparability of turnover for computer services will become more transparent between VG countries upon the adoption of ISIC v4 and NACE v2.

Another issue mentioned at last years VG meeting is rapid industry consolidation among the larger players through buyouts or mergers which could create survey/sampling problems. On a post sample basis, problems may arise due to the dynamic nature of the type of services produced. For instance, because inputs to the production transformation process are primarily expert technical knowledge, barriers to market entry are relatively low. Therefore it should not be surprising that establishments in these dynamic industries, especially computer consultancy services, can rapidly shift/adjust their outputs to maximize revenue.

Sample design strategies may also be affected by a market structure that keeps turnover highly dispersed. For instance, in 2004 The Netherlands estimated that 22 companies in the Software consultancy industry had a market share of about 45 percent, with the remainder split among 30,000 companies.[9] In the more widely defined IT services sector, France reports that 88 percent of businesses account for only 17 percent of total IT services turnover. There is a similar skew in the U.S. with non-employers accounting for 70 percent of establishments but only 4.5 percent of total revenue for NAICS 54151.[10]

Because the outputs of ISIC Division 62 are primarily classified as Intermediate consumption, in principle they should not contribute to GDP measurement issues. The exception here is Computer programming activities which is treated in the national accounts of most VG countries as investment. However, the treatment of software as investment in the U.S. is a recent occurrence. Prior to 1998 the U.S. treated software as intermediate consumption. In the 1999 benchmark revision, the U.S. shifted software from intermediate consumption to investment in the national accounts which increased the rate of annual GDP growth by 0.20 percentage points (from 1989-98).[11] Generalizing from last year's mini-presentations, Computer programming activities is substantially less important (both in relative and nominal terms) in other VG

[9] Statistics Netherlands experienced a "relatively low response" in a pilot study and is therefore using "a high over-sampling factor" in their current sample design.

[10] Murphy, (2007), *Computer Programming, Consultancy, Information Service and Related Activities Turnover Measures and Practices at the U.S. Census Bureau*, pg. 4.

[11] From BEA methodology paper presented by Bruce Grimm and Robert Parker in May 2000 to the BEA Advisory Committee-see references.

countries and therefore a shift from consumption to investment may have had a lesser effect on their GDP growth measures.

Another concepts/measurement issue related to GDP is a different form of computer programming service called own-account software. In the U.S. national accounts own-account software is described as consisting "of in-house expenditures for new or significantly enhanced software created by business enterprises or government units for their own use". One of the difficulties in measuring own-account software is that it is not a NAICS or ISIC defined industry. Currently the national accounts measures U.S. turnover for own-account software by expenditures that include wages, salaries, related compensation, materials and supplies consumed and indirect costs.[12] These own-account expenditures may occur in ANY industry and are included in GDP as investment to represent expenditures for analysis, design, programming and testing of software. A long-standing issue with measuring output on an expenditure basis rather than revenue/turnover is that changes in labor productivity can be obscured.

A more general point brought up in one of last year's mini-presentations is that data sources at the industry level used to arrive at computer services turnover values may be incomplete or out-of-sync with national accounts concepts.[13] This last point is further complicated by the tendency of many ISIC Division 62 firms to engage in multiple service specialties that may change the nature of their primary business activity over relatively short time frames.

Table 3.0 provides an overview in terms of practices (best, good and minimum) for a turnover series. Some general/rough approximation of cost is also provided for each category. Comparisons of costs between countries for the different turnover measurement practices is not analyzed due to large differences in institutional infrastructures, fixed costs, sample size and information collection/processing resources.

**Table 3.0: Options for Developing Turnover Statistics for Computer Programming, Consultancy and Related Activities**

| Category | Data Source And method of collection | Level of Detail Collected | Frequency | Advantages And Disadvantages | Cost approximation from a Selected Country's experience |
|---|---|---|---|---|---|
| Best practice | One or many surveys with different frequencies (may include Economic Census)<br><br>**Methods:**<br><br>Mail survey | Industry detail according to ISIC or NAICS or ANZSIC<br><br>Product detail (CPC, NAPCS, | Annual and sub-annual collection (monthly or quarterly) | **Advantages**:<br>Provide detailed information for the national accounts on a timely manner (monthly, quarterly and annual data)<br><br>Provides benchmarking and current economic | **Korea**<br>IT industry surveys are conducted in Korea monthly and yearly. The basic turnover data is collected by fax, e-mail and interviews. Monthly and yearly turnover data are sample survey and census respectively.<br><br>The monthly survey sample size is about 3,800 respondents and yearly census is about 19,000 respondents. |

[12] BEA's (Bureau of Economic Analysis) use of indirect costs in the national accounts include "depreciation of plant and equipment, utilities, travel, property and other taxes, maintenance and repair of plant and equipment, and overhead—including personnel, accounting and procurement".

[13] The Mieke Berends-Ballast's paper, *Turnover and Output Measurement for the Computer Services Industry in the Netherlands*, presented at the 2007 VG Meeting mentioned that "source statistics sometimes differ from concepts used by the National Accounts".

| | | | | | |
|---|---|---|---|---|---|
| | Interview and mail survey<br><br>Census | NACE) | | analysis<br><br>Allows the construction of I-O tables (commodities by industries)<br><br>**Disadvantages:**<br><br>This option is the most expensive given complexity of the survey<br><br>Large response burden<br><br>Response rate are normally lower for this kind of survey | Yearly survey includes more detailed Information.<br><br>To produce IT surveys, the resources are:<br><u>Monthly</u><br>Collection : 14 non-specialized staff<br>Edit and Imputation : 1 specialized staff<br>Analysis and dissemination :<br>5 specialized staff<br><u>Yearly</u><br>Collection : 37 non-specialized staff<br>Edit and Imputation :<br>1 specialized staff<br>3 non-specialized staff<br>Analysis and dissemination :<br>5 specialized staff<br><br>**Sweden:**<br><br>Annual turnover by product based on administrative (tax) data.<br>Approx. 600 establishments are included in the NACE 72 sample with the 16 largest receiving complete questionnaires. The rest (with more than 10 employees) receive less detailed questionnaires focused on distributions or turnover by product.<br><br>**US:***<br>Economic Census-$4.98 million<br>Annual Survey-$368.5 thousand<br>Quarterly Survey-$69.3 thousand |
| Good practice | One or many surveys with different frequencies<br><br>**Methods:**<br><br>Mail survey<br><br>Interview and mail survey | Industry detail <u>only</u> | Annual and Sub-annual | **Advantages**:<br><br>Provide detailed information for the national accounts on a timely manner (monthly, quarterly and annual data)<br><br>Provides benchmarking and current economic analysis<br><br>**Disadvantages:**<br><br>This option is the most expensive given complexity of the survey | |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Large response burden<br><br>Response rate are normally lower for this kind of survey | |
| Minimum requirement | Administrative (tax data, industry association data etc.,) | Industry detail only | Annual | **Advantages;**<br><br>Least expensive<br><br>Little or no response burden<br><br>Large coverage<br><br>**Disadvantages:**<br><br>Data coverage and definition can be imprecise<br><br>Least timely | |

*For additional detail on resources used by the U.S. for developing turnover statistics, please see appendix 2.

## 4.0 Service Producer Price Index (SPPI)

Survey results from 2007 indicate that publication of SPPI statistics is less comprehensive than turnover statistics for ISIC Division 62 industries (see section 2.1). For instance, only 8 (44%) countries produce price indexes for ISIC 6201, 9 (50%) produce price indexes for ISIC 6202 and 6 (33%) produce price indexes for ISIC 6209. Unfortunately, only 1 country reported that it produces an SPPI with detail equal to or greater than the CPC detail for ISICs 6201, 6202 and 6209. For more information on survey response by industry see Appendix 1.

Internationally there is almost no alignment at the detailed (CPC or better) level between turnover and prices. On the other hand at the higher industry level, 6 (33%) countries reported alignment between turnover and prices for ISIC 6201, 7 (38%) reported turnover and price alignment for ISIC 6202 and 5 (27%) reported turnover and price alignment for ISIC 6209. Coverage should expand in the future as three countries are developing industry turnover and price data for ISICs 6201 and 6202 and two countries are developing turnover and price data for ISIC 6209.

Standardized definitions and terminology for the various pricing methodologies was presented at the 2007 VG meeting in a paper titled, *Thesaurus of Producer Price Indices for Services (SPPI's).* The Thesaurus lists seven pricing methodologies and six common pricing data types

which are shown in tables 4 and 5.[14] For detailed descriptions of the pricing methodologies and data types, please refer to the Thesaurus.

**Table 4. Pricing Methods**

| |
|---|
| Component pricing |
| Contract pricing |
| Direct use of prices of repeated services |
| Model pricing |
| Percentage fees |
| Pricing based on working time |
| Unit values |

**Table 5. Pricing Data Types**

| |
|---|
| Percentage fees and related value |
| List prices |
| Input prices |
| Real transaction prices |
| Revenue and amount sold |
| Expert estimate |

The most straightforward pricing method from table 4 is the "Direct use of prices of repeated services" which is usually an unambiguous and complete transaction price and therefore may be considered the preferred of the seven methods for most service industries. However, in the real world, services transactions are often too complex or opaque to implement in this method so an appropriate alternative method must be chosen to fit the available data and level of respondent cooperation.

Based on the VG SPPI mini-presentations, the most common pricing method used for *Computer Programming, Consulting and Related Activities* is based on charge out rates or more properly the Thesaurus terminology is "Pricing based on working time".

France publishes industry-level price indexes for all ISIC Division 62 industries using the following price methodologies:

| France SPPI | ISIC Division 62 |
|---|---|
| Price Methodology | Utilization Rate |
| •Contract pricing | 7% |
| •Direct use of prices of repeated services | 14% |
| •Model pricing | 4% |
| •Pricing based on working time | 75% |

The Netherlands currently publishes price indexes for *Other software consultancy and supply* (NACE 72.22 rev 1.1) which is roughly equivalent to ISIC 6201 and part of ISIC 6202. Like France, The Netherlands have chosen charge-out rates as the most practical pricing methodology.

[14] Part of the intent behind developing an SPPI Thesaurus was to establish a common terminology that would be *used in future mini-papers and sector papers of the Voorburg Group.*

Last year's mini-presentation reported that their choice of charge-out rates was based on the nature of company billings (invoices) and information gleaned from a pilot research project on Software Consultancy Services. Price indexes for the remaining ISIC/NACE 62 industries are currently in development.[15]

Korea takes a different approach in the choice of optimal price methodology. Korea currently publishes a price index for ISIC 6201- *Computer Programming Activities*, but unlike France and The Netherlands, the primary pricing methodology is based on model pricing. The rationale stated for selecting model pricing is that it is difficult to "set a constant quality specification for custom software".[16] The actual construction of model specification in the Korean SPPI is not obtained directly from a sample of computer programming establishments, but from the Korea Software Industry Association (KOSA). KOSA also provides the price or cost data and "labor costs are calculated based on the *Standard of Compensation for Software-related Business* announced by the Ministry of Information and Communication".[17] In the conclusion of the Korean mini-presentation several future improvements regarding their SPPIs were mentioned including the "survey of the real prices on items for which model pricing is now used".[18]

At this time the United States does not publish or collect price data for ISIC Division 62 industries.

The accuracy or appropriateness of charge-out rates is partly determined by the type of service provided. The French mini-presentation distinguished between a service described as an "obligation of means" and a service described as an "obligation of results". An obligation of means appears to be relatively straightforward and therefore more amenable to the use of charge out rates. For instance, if a client contracts for technical support services to maintain software applications or install PCs, then the "price" may simply be based on the number (and quality/experience) of staff resources provided times the number of hours or days billed. The charge-out rate is a common pricing mechanism for IT services providers and should be structured to cover staff resources committed to provide specified services as well as overhead and profit (in other words a transaction price). The specified service to be priced should of course be described in detail so that the price statistician is able to determine when the "matched model" is violated. On the other hand, "obligation of results" may involve a much more complex array of services delivered in phases over a multi-year time frame. The "price" may often derive from negotiations between the producer and client based on estimates that try to account for staff requirements, length of job, type and complexity of job and may specify substantial bonus or penalty clauses for material deviations from initial estimates. Examples of an "obligation of results" service could include developing a custom software application to interface with a specific business process or designing/upgrading a network infrastructure to meet or exceed minimum stated performance metrics. In both examples, the services contracted may be too complex to be priced over time on a comparable or matched model basis with charge out rate(s). Like many custom or complex services, there may not be an ideal pricing method available that satisfies all users. Depending on levels of cooperation and data availability, there may be situations where model or component pricing may provide an imperfect but pragmatic compromise to a difficult measurement challenge.

[15] Kirsten, (2007), *The PPI for Software Consultancy services in The Netherlands*, pgs. 3-4.
[16] Lee, (2007), *Producer Price Index for Computer Services and Related Activities in Korea*, pg. 2.
[17] Ibid.
[18] Ibid., pg. 8.

### 4.1 Main Issues with Price Measurement

One of the interesting issues raised in last years French mini-presentation is that "*captive entities (IT support companies) which only insure the management assistance for a group or chain of shops*" generate almost 25 percent of turnover for ISIC 62.0.[19] In France, prices are not collected from these "captive entities" because they may represent transfer prices, though turnover for these entities are collected. Deciding to collect prices that may be transfer rather than market is a long-standing issue for many statistical agencies. As a general guideline when transfer or non-market transactions are captured in the national accounts as part of industry revenues, then the "best" deflation properties are more likely to be obtained with price indices that also include transfer or non-market prices.

Another potential issue mentioned at last years VG meeting is rapid industry consolidation among the larger players through buyouts or mergers which could create sampling problems. On a post sample basis, problems may arise due to the dynamic nature of the type of services produced. For instance, because inputs to the production transformation process are primarily expert technical knowledge, barriers to market entry are relatively low. Therefore it should not be surprising that establishments in these dynamic industries, especially computer consultancy services, can rapidly shift/adjust their outputs to maximize revenue. This rapid shift in outputs places additional pressure on both statistical agencies and respondents to frequently "refresh" collected data, especially when charge-out, component or model based prices are used. Of course, when a new service replaces the incumbent service, the price index practitioner then is likely to face the problem of how to identify, quantify and then value any quality changes.

Correctly identifying, quantifying and then valuing changes in output quality is one of the oldest and most challenging measurement problems faced by price index practitioners. Overlap, resource cost and hedonic methods represent some of the common quality valuation tools used in statistical agencies. The more dynamic the industry, the greater the need for a robust quality valuation tool-set. The outputs of *Computer Programming, Consultancy and Related Activities* certainly qualify as dynamic, but the ability to explicitly and accurately value changes in quality remains a work in progress.

In the U.S., the Bureau of Economic Analysis (BEA), which produces the national accounts, has attempted to develop a robust quality valuation methodology for custom/own-account software over a period of several years. Building on methods first proposed in 2001 by the McKinsey Global Institute (MGI), the BEA explored the possibility of constructing constant quality price indices for custom/own account software by accounting for changes in factors such as the number of function points and value adjustment factors (VAF). Function points can be thought of as a metric for the data manipulation capacity designed into software. VAFs were used to adjust function point counts based on a set of 14 factors that address features such as relative ease of use, performance and communications capabilities. Using proprietary data that included thousands of observations, the BEA attempted to construct quality-adjusted price indexes using

[19] Camus, Grac, Salvatori, (2007), *Mini-presentation on turnover/output in France*, pg. 3.

hedonic models. Many different specifications were used in their econometric research but the basic regression took the form:

$$\ln[\mathrm{Price}]_{IT} = \alpha + \beta_1[FunctionPoints]_{IT} + \beta_2[VAF]_{IT} + \beta_3[Attributes]_{IT} + \beta_T[Year] + \varepsilon$$

Where,
ln = log price
I = project, I =1,…,n
T = year, t =1993,…,2003
$\alpha$ = intercept term
VAF = value adjustment factors
$\varepsilon$ = random disturbance (error) term

Unfortunately year-to-year volatility has kept this project in the research phase. At this time, BEA has indicated that there are no plans to deploy the project into production (for use as a deflator). The task that BEA took on is exceptionally difficult and the construction of aggregate quality adjusted price indexes for custom/own account software has eluded many well known researchers. A paper may be forthcoming from BEA that describes this research effort in greater detail. The attempt to develop deflators for custom software is mentioned to show that advanced and interesting work has been undertaken in this area and to also show that much work remains before a robust measure of quality change can be introduced in "official" price statistics.

In the meantime, the U.S. national accounts have decided to deflate custom and own account software with a hybrid index. This proxy deflator combines input costs and the U.S. PPI's Prepackaged software index in a 75 percent (input costs) – 25 percent (prepackaged software) weighted average. Prepackaged software was included as part of the deflator in part to avoid the problem of downstream static productivity indicators. The problem of static productivity measures caused when turnovers measured by expenditures are deflated entirely by input costs has been extensively described in the literature. While not an ideal solution, the options were limited because the U.S. does not currently publish an output SPPI for custom software.

Valuing quality change for many of the services offered by computer consultants may be as challenging/elusive as valuing quality change in custom software. Because the output of computer consultants tend to be customized to the needs of the client the initial specification (job) that is sampled and repriced will almost certainly become less representative of current outputs over time. What was once mainstream may now be niche or obsolete. To the extent that new computer consulting jobs outside of the initial sample have price movements/trends that differ from the originally sampled job, an "out of sample" bias may be introduced. One remedy for this bias is to increase the frequency of industry samples which can be costly or to directly ask individual respondents to give new jobs a chance of selection based on probability techniques (in the U.S., this is called directed substitution). Once the new job is introduced as the substitute for the old job, a more representative price trend may be obtained. However, the "solution" to this bias problem introduces the additional problem of disentangling price change from quality change in the initial substitution/comparison period between the old and the new.

For countries publishing computer consulting indexes it appears that the most common quality change valuations are based on overlap or estimating the initial pure price change implicitly by price changes of similar services. Hedonic techniques do not appear to be a promising option at this point, especially for services derived from an obligation of results. The lack of research and development efforts for hedonic techniques in computer consulting is due to scarce agency resources, the complexity of consultancy outputs, lack of sufficient data to support a robust model and the difficulty in specifying a model with job characteristics consistently defined and measured across observations.

Another price measurement issue that has had much discussion is tied to situations in which computer service establishments subcontract or outsource parts of a computer services job, especially when the subcontractor is an off-shore establishment (affiliated or not). One of the concerns is that charge out rates may provide poor estimates of real price change when parts of a job are outsourced. Before addressing this concern, it should be understood that even when outsourcing does not occur, charge out rates must be based on detailed specifications that clearly identify the work requirements, the type, number, skill levels and time requirements of staff as well as profit and overhead. As an example, let's assume that the entire output of a sampled computer consulting establishment is Job A which is priced at $1800 per day in period t and can be broken down as follows:

**Table 6: Pricing and Component Services Provided to Job A Client in Period t**

| Job A | Daily rate | Quantity | Charged to Client |
|---|---|---|---|
| Software Developer (Java Expert level-5 years experience) | $500 | 2 | $1,000/day |
| Network Designer (Cisco Enterprise switches/routers expert level-5 years experience) | $800 | 1 | $800/day |
| | | | |
| Total Daily Charge-Out Rate Period t | | | **$1,800/day** |

The price charged to the client for two software developers with Java expertise and one network designer with Cisco LAN equipment expertise is $1,800 per day. This daily rate includes profit and overhead expenses and represents the transaction price (revenue received) for the computer consulting establishment. In this example, because the charge out rate is a transaction price, it is a "best" practice price method for a Computer Consultancy SPPI. As long as the services consumed by the client for Job A are unchanged, then an appropriate measure of price change is obtained by directly comparing the daily charge out rate in period t+1 with the daily charge out rate in period t.

Using data in table 6 as a baseline, we can expand the Job A environment into one of many possible outsourcing scenarios. For instance it would not be too much of a stretch to envision a scenario in which increasing global competition force the computer consulting establishment in our example to aggressively search for ways to cut their labor and overhead costs. One cost reduction method that continues to grow in popularity is to subcontract IT services work to relatively low-labor cost but technically proficient countries such as India. However, as a general rule, while global competition encourages cost efficiencies, it does not allow computer

service providers to sacrifice output quality (if output quality declines relative to global competitors then reducing costs AND quality is a short term response that is likely to fail). Continuing the Job A example, the computer consulting establishment decides to outsource the current software development activities in period t+1 to an IT contractor in Bangalore, India. The network design activities are kept in-house in period t+1 due to the requirement of frequent face to face meetings with the client. The net effect on the computer consulting establishment's bottom line is to lower the cost of two software developers from $1,000 per day in period t to $600 per day in period t+1. Market conditions will determine whether all or only a part of the cost reduction will be passed on to the Job A client. Let's assume that the computer consulting establishment reports the total period t+1 price as $1,400 per day as shown in table 7.

**Table 7: Pricing and Component Services Provided to Job A Client in Period t+1**

| Job A | Daily rate | Quantity | Charged to Client |
|---|---|---|---|
| Software Developer (Java Expert level-5 years experience) | $300 | 2 | $600/day |
| Network Designer (Cisco Enterprise switches/routers expert level-5 years experience) | $800 | 1 | $800/day |
| | | | |
| Total Daily Charge-Out Rate Period t+1 | | | **$1,400/day** |

So long as the services provided by the outsourced software developers in period t+1 are the same quality as the in-house software developers used in period t, then from the perspective of a price index practitioner, outputs are unchanged. In both periods (t+1 and t) the total daily charge out rates represent transaction prices (net revenue/turnover to the computer consulting establishment) and therefore should be directly compared. If we consider Job A as representative of the entire industry then it is easier to see that the resulting measure of price change [($1,400/$1,800)-1] = -22.22% is an appropriate deflator because it correctly results in output/turnover being measured as unchanged. An important caveat is that if the charge-out rate collected from the respondent is really a list price with no price corrections/adjustments due to shifts from in-house to contracted services, then the standard problem of collecting list prices without adjustments would also apply in our example.

Table 7.0 provides an overview in terms of practices (best, good and minimum) for a SPPI series. Some general/rough approximation of cost is also provided for each category. Comparisons of costs between countries for the different turnover measurement practices is not analyzed due to large differences in institutional infrastructures, fixed costs, sample size and information collection/processing resources.

**Table 7: Choices for Developing SPPI Statistics for Computer Programming, Consultancy and Related Activities**

| Category | Pricing method | Data type in the survey and frequency | Quality and Accuracy | Cost |
|---|---|---|---|---|
| Best | Observed transaction prices: | Data is based on real transaction prices. | Advantages:<br><br>Detailed service | **France:** |

| | | | | |
|---|---|---|---|---|
| | 1. Prices of repeated services<br>2. Prices based on working time (charge-out rates) | Can be monthly or quarterly. | specifications allow time-consistent comparisons.<br><br>Real transactions ensure prices are highly representative of service activity.<br><br>Disadvantages:<br><br>Most expensive, with highest response burden | Collects price data quarterly from 174 companies that provide 1150 price quotes (initial collection of data is done on-site)<br>Collect data: 1 staff member<br>Dissemination: 1 staff member<br><br>**Sweden:**<br><br>Collects price data quarterly, weights updated annually.<br>Data collection, edit, review and calculation: 10 staff members |
| Good | 1. Model Prices<br>2. Contract pricing | Input data, where re-pricing can be taken from a list or be estimated by an expert.<br><br>Normally done on an annual or quarterly basis | Advantages:<br><br>Detailed service specifications are held constant over a period of time, which allows time-consistent comparisons.<br><br>Disadvantages: Models/contracts need to be reviewed and updated frequently to be representative and realistic.<br><br>Less expensive, high response burden. | **Korea:**<br>Data Collection resources (prepackaged software included)<br><br>0.1 non-specialized staff<br>0.2 specialized staff<br><br>Edit, Review and Dissemination Resources :<br>0.2 specialized staff<br><br>The prices of customized soft ware are surveyed on model prices.<br>Repriced monthly. |
| Minimum | 1. Unit value (average prices)<br>2. Component pricing | Revenue and amount sold.<br><br>Part(s) of a job must be identified that can be repriced and serve as proxy for unobserved total transaction price.<br><br>Can be monthly, quarterly or annual. | Advantages<br>Transactions in a group must be sufficiently homogeneous (i.e. quality of individual services is unchanged and their quantities in the transactions do not vary). Otherwise, changes can be highly volatile.<br><br>Disadvantages: | |

| | | | | |
|---|---|---|---|---|
| | | | Revenues have to be well-defined for consistency in comparison.<br><br>Components may not continue to be representative of more aggregate price change.<br><br>Least expensive, lowest response burden for unit value pricing. | |

The publication of constant quality industry output price indexes for the services sectors will always present significant challenges. Current methods used in SPPIs for computer services represent on-going and noteworthy improvements but a tremendous amount of work remains. Future improvements will require a combination of research, targeted efforts to improve reporter cooperation, more extensive use of outside expert advice and improved access to detailed and accurate secondary source (often proprietary) data.

# Appendix 1.

**Table A: Summary of Countries Measuring Computer Programming, Consultancy and Related Activities***

| | ISIC 6201<br># of Countries | ISIC 6202<br># of Countries | ISIC 6209<br># of Countries |
|---|---|---|---|
| Industry-level prices calculated | 8 | 9 | 6 |
| Industry-level turnover calculated | 12 | 13 | 12 |
| PPI Details ≥ CPC*** | 1 | 1 | 1 |
| PPI Details ≥ CPC soon** | 0 | 0 | 0 |
| Turnover details ≥ CPC | 4 | 5 | 4 |
| Turnover details ≥ CPC soon** | 1 | 2 | 2 |
| Industry-level turnover and prices aligned | 6 | 7 | 5 |
| Industry-level turnover and prices aligned soon** | 3 | 3 | 2 |
| No Direct industry coverage for prices and/or turnover | 9 | 8 | 11 |

** From the Voorburg Group Country Progress Report: 2007 (18 countries reporting)*

*** In development*

# Appendix 2

## Rough Approximations (with caveats) of Turnover Statistics Resources used for Computer Programming, Consultancy and Related Activities

[The following information was provided by John Murphy of the U.S. Bureau of the Census]

In order to capture all costs associated with the infrastructure required to produce various turnover or output statistics, the information provided below is based on a prorated allocation of total program costs either annually or over the five year time line for an economic census. Total costs include planning, programming and hardware costs, printing, mailing, processing, tabulation, analysis, and dissemination. The addition of any given industry has a fairly small marginal cost up to a certain point where additional infrastructure would be required.

These cost estimates exclude the costs associated with the maintenance of the Business Register used for Census mailing lists and sample frames.

### Estimates

### 2002 Economic Census

Total Cost: $319,000,000 (est) over a six year period
http://www.census.gov/prod/ec02/ec02-00r-hist.pdf

Covered establishments: 6,773,632

Unit Cost = $47 per unit

105771 units = $4.98 million would be the full share cost of the units in NAICS 5415.

In the Census service area, the average analyst covers approximately 10 NAICS industries. This is an average. Some industries require individual attention because of their size or complexity. There are also analysts that only address disclosure or dissemination tasks for the entire area. One analyst ($40,000-$90,000) for an average of each 10 industries represents a small marginal cost for staffing only.

### 2007 Service Annual Survey

Annual total survey cost estimate: $6.7 million

Prorated cost of 5415: $368,500 annually

Analysts on average cover a standard workload of approximately 3,000 cases in the annual survey. The sample size of an industry would impact staffing – one new analyst ($40,000 to $90,000 depending on seniority and tenure) for each 3000 sample units.

### 2007 Quarterly Services Survey

Annual total survey cost estimate: $3.3 million

Prorated cost of 5415: 69,300

## Summary

These rough estimates provide a cost estimate to deliver one set of annual estimates, 4 quarterly estimates, and one set of Economic Census benchmark data each five years. The overall cost of the turnover programs on that basis is roughly $329 million and the prorated share for the IT services in NAICS Industry Group 5415 is approximately $5.4 million. These estimates do not include overhead such as business register costs, the center for economic studies, and other Bureau resources that were not readily allocated to the economic programs for service statistics. As such, these estimates provide a rough order of magnitude and cannot be used as the basis for actual program development.

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