

## Chapter 8. Information and telecommunication

*This chapter presents practical guidance as well as main issues and challenges for compiling SPPIs for Publishing of books, periodicals and other publishing activities (ISIC 581), Software publishing (ISIC 5820), Telecommunications (ISIC 61), and Computer programming, consultancy and related activity (ISIC 62).*

## 8.1. Publishing of books, periodicals and other publishing activities (Denis Gac, INSEE)

### 8.1.1. Industry description (ISIC 581)

Publishing is the process of production and dissemination of literature, music, information and other content. Traditionally, the term refers to the distribution of printed works such as books, newspapers and magazines, directories and mailing lists, and other materials such as photos, engravings, postcards, posters and reproductions of works of art. These materials are characterised by the intellectual creativity required in their development and so are usually protected by copyright. The acquisition of copyrights to content (information products) are therefore included in this group, in addition to making this content available to the general public by engaging in (or arranging for) its reproduction and distribution in various forms.

In recent years digital publishing has emerged as important publishing activity. Additionally, free media activities (internet, free newspapers) are an increasingly important component of publishing activity although it is not yet clear as to how they should be treated from the perspective of SPPI compilation.

#### *Characteristics of book, newspaper and magazine markets*

Markets for traditional publishing activities in OECD countries are often dominated by a small number of very large publishers accounting for a very large share of total output. For example, in France the two largest publishing groups account for about 35% of book sales while the twelve largest publishers account for nearly 80% of sales.

The market for books is also characterised by a very large diversification of supply with a shorter lifetime of books and a decreasing number of copies of each edition. While the number of copies sold tends to decrease (e.g. -2.1% in 2012 in France), the number of editions sold is increasing (e.g. +3.0% in 2012 and +2.0% in 2013 in France).

Newspaper publishers operate in a two-sided market as they sell news to readers and readers to advertisers. Consequently, traditional sources of publisher revenue are sales of printed newspaper and print advertising; both have however been negatively affected by the economic crisis of 2008. The newspaper market has suffered an erosion of revenue from print newspaper and consequently from advertisers, and also increasing competition from online content. New online and mobile services have (in very many cases) yet to grow into profitable businesses. Even this system is not yet mature in all countries; there is a trend towards development of on-line paperless newspaper such as the Huffington Post, Slate, Mediapart etc.

The magazine publishing sector is highly concentrated with a clear segmentation of supply (TV magazines, specialised journals, women's/men's press, youth press etc.).

#### *Price determining characteristics*

The objective when compiling a SPPI for publishing of books, periodicals and other publishing activities is to analyse the revenue of the publisher. In this respect, four issues should be presented:

1. The intrinsic quality of book or newspaper, such as the number of pages or the reputation of the writer, largely determines its price. If a “fixed book price policy”<sup>1</sup> is not applied in a country, the type of distribution channels (for example retailer, club or direct sale by the publisher) may also influence final price of a

book. However, it is important to note that major publishers groups are often distribute their books via affiliates; As in the case for books, the intrinsic quality of a newspaper and the distribution channels (for example retail shop, home delivery or subscription) influence its final price. While sales by retailers have declined, sales by subscriptions have been the most resilient distribution channel since the economic crisis.

2. The SPPI for publishing activities should measure prices received by publishers, net of transport and retail margins;
3. A large share of a publisher's revenue (especially in the cases of newspaper and magazine publishers) comes from the sale of advertising space. Therefore the SPPI for publishing could be jointly operated with the SPPI for Advertising (ISIC 731);
4. Publishers also generate revenue from the sale of licences, for example to create games or movies from a book. The amounts of revenue generated can be very erratic and the activity is difficult to monitor. Given the measurement challenges and the small share of total industry output resulting from the sale of licences, this activity is often excluded from SPPI coverage.

### *8.1.2. Classification aspects*

#### *8.1.2.1. Industry classification*

The publishing of books, periodicals and other publishing activities are classified under ISIC section J - Information and communication, division 58 - Publishing activities, group 581. The creation of section J in the ISIC was a major development in the classification system. This new grouping gives coherence to activities focussed on the production of intellectual content which were organised according to the format of dissemination (for example printed vs. online books, printed vs. online newspaper) in previous versions of the classification system. However, it should be noted that the printing and reproduction of recorded media (division 18 of ISIC) is still classified under manufacturing.

The publishing of software (group 582), motion pictures, video and television programme activities (group 591) and sound recording and music publishing activities (group 592) are all classified elsewhere.

The publishing of books, periodicals and other publishing activities are classified under group 581 in the ISIC classification. This group is divided into four classes:

- 5811 - Book publishing;
- 5812 - Publishing of directories and mailing lists;
- 5813 - Publishing of newspapers, journals and periodicals;
- 5819 - Other publishing activities.

The NACE, NAICS and ANZIC classification systems are almost identical to the ISIC classification, the difference in each case being the distinction between the publishing of newspapers and the publishing of journals and periodicals (see annex A).

### *8.1.2.2. Product classification*

Activities relating to the publishing of books and periodicals, and other publishing activities are classified in the CPC classification system under section 8 - Business and production services, division 89 - Other manufacturing services; publishing, printing and reproduction services; materials recovery services, group 891 - Publishing, printing and reproduction services, class 8911 - Publishing, on a fee or contract basis.

In both the CPA and NAPCS classifications however, the products are classified in line with the NACE and NAICS classifications respectively, reflecting the treatment of publishing activities as information and communication services rather than as manufacturing. These international industry and product classifications therefore provide a consistent hierarchy from industry to service products.

It is interesting to note that in France an alternative nomenclature was developed in order to better approximate the way in which the industry classifies different service activities. According to this alternative nomenclature the output of the publishing industry in France can be disaggregated between:

- Sales of physical books, newspapers, journals, periodicals;
- Sales of on-line books, newspapers, periodicals;
- Sales of advertising space in those books, newspapers, journals and periodicals<sup>2</sup>;
- Sales of licenses for copyrights of original works (4% of sales for book publishers in France).

### *8.1.3. Scope of the survey*

Ideally, the SPPI should track constant quality price change for the full range of output to all end users (such as business, household, exports and government etc.). In practice compilers may limit scope to the activities (and end users of these activities) which account for the largest shares of output. As such, inclusion in the SPPI of ISIC 5812 - Publishing directories and mailing lists, may not be necessary where the class accounts for only a very minor share of the total output of the group and is therefore unlikely to have a significant impact on the overall price index.

Additionally, it is often difficult to separate prices charged to different end-users of publishing services and compilers may instead calculate a single PPI covering all end users. As an example, INSEE aims to calculate all of its SPPIs on both a BtoB and BtoAll basis, and to only compile BtoC and BtoE indices for a limited set of activities. The SPPI for publishing activities is currently published on a BtoAll basis only.

As previously noted, it is not yet clear as to how “free media” activities should be treated within the SPPI framework.

### *8.1.4. Sample design*

Ideally, probability proportional to size (PPS) sampling should be employed, using turnover as the size variable. Stratified sampling, using turnover or number of employees as the stratification variable, may be utilised to improve efficiency of the sample by reducing variance. Industry representative organisations may provide advice in respect of how the sample is structured.

In France, the sample has been developed to reflect the relative importance of different publishing activities. Distinctions are made between:

- Paperback and other books;
- The different distribution channels for books (libraries, schools, bookshops etc.);
- Book themes (accounting for specialists publishers);
- Newspaper types (national, regional, local, free);
- Magazine types.

In order to facilitate the ongoing price measurement of books, it may be helpful to consider three categories of repeatable services:

- Titles which are published repeatedly (*e.g.* annuals);
- Series of successive books (*e.g.* encyclopaedias);
- Titles from a well-known author which could reasonably be considered as having the same quality.

#### ***8.1.5. Collection of information and specification of the service***

Representative service products, for each of the different types of service activity, should be identified and adequately specified during the respondent initialisation process. Detailed product specification information facilitates pricing to constant quality in future periods.

Specifications may include the definition or category of the published material (for example, fiction, and crime), the title and author, the size and number of pages, size, and the type of binding.

#### ***8.1.6. Main pricing methods***

Tracking constant quality price change for the full range of publisher output needs to monitor price of books, newspaper and magazine and advertising space sales in newspaper.

It should be noted that the use of CPI prices for publishing services may not be suitable for use in the compilation of the SPPI where trade and transport margins are included in the price paid by the consumer.

##### ***8.1.6.1. Book publishing***

Prices should be measured at basic prices and therefore exclude taxes and trade and transport margins. The basic price reflects the price paid by the distributor or the retailer, rather than the consumer. The price paid for a book by the distributor or retailer may be 40-70% less than the list price to the final consumer (Vizner, 2013).

Typically, the direct use of prices of repeated services or contract price methods are employed for the ongoing measure of price development of books. As shown in box 1, when public price is collected, it should be net of taxes, and associated, according to the type of book, with bookseller average discount rate, number of pages and margin of delivery and diffusion.

**Box 8.1.1. French examples of types of prices collected for books**

N° of series	Definition of price series	Kind of prices collected
A	"Tales and legends of Brittany"	Public price
B	"Tales and legends of Brittany"	Average discount rate

Price to be used:  $A * (1-B)$

N° of series	Definition of price series	Kind of prices collected
A	"Secondary schools / code 004757 / geography / high school"	Public price, net of taxes
B	School books	Bookseller average discount rate

Price to be used:  $A * (1-B)$

N° of series	Definition of price series	Kind of prices collected
A	"I learn to draw" / last release	Public price, net of taxes
B	"I learn to draw" / last release	Number of pages
C	"I learn to draw" / last release	Margin of delivery and diffusion

Price to be used:  $A * B^{-1/2} * (1-C)$

For major publishing houses that sell books in large quantities, it may be necessary to distinguish between the different types of retailers (for example supermarkets typically only stock current best sellers). It should be noted that the prices for educational books are often fixed by regulation.

#### 8.1.6.2. *Newspaper and magazines*

The unit value method is typically employed where large numbers of transactions of homogeneous products occur. Under this method, the price of the publishing service is derived by dividing revenues from sales by volumes of services provided in respect of a large number of transactions. This method is particularly appropriate to the measurement of prices of publication of newspapers and journals, although the compiler should distinguish between the different forms of distribution (for example by dealer or bookseller, posted by subscription, internet subscription).

**Box 8.1.2. French examples of types of prices collected for newspapers**

Definition of price series	Kind of prices collected
Newspaper day of the week	Sales in kiosk / net average price for one issue without retailer trade margin
Newspaper day of the 7th day	Sales in kiosk / net average price for one issue without retailer trade margin
Subscription 7 days carried home all the year / 364 issues	Net average price for one issue
Subscription 7 days carried home all the year / 30 issues	Net average price for one issue
Posted subscription 6 days for one year / 312 issues	Net average price for one issue
Posted subscription 6 days for one year / 25 issues	Net price of the subscription
Women	Net average price (net publisher turnover / number of issues sold)
Television	Net average price (net publisher turnover / number of issues sold)

Subscription prices, especially in the case of newspapers, can vary according to the length of the subscription. Similarly, prices may be reduced for prepaid subscriptions. In order to price constant quality services, the compiler should ensure that representative subscription services are well specified.

*8.1.6.3. Advertising space in newspaper*

Revenue from sales of advertising space is usually shared between the publisher and the advertising selling agency (usually paid on a commission basis).

Considering the full price for advertising space, quality adjusted, (P) and the commission rate for the seller of advertising space (C), INSEE calculates price indices for both the provision of advertising sales (NACE 73.12), the publishing of directories and mailing lists (NACE 58.13) and the publishing of newspapers, journals and periodicals (NACE 58.14) on the basis of:

$$\text{Price for NACE 73.12} = C * P$$

$$\text{Price for NACE 58.13 or NACE 58.14} = (1 - C) * P$$

There is often a close collaboration between agencies selling advertising space and newspaper publishers and therefore consideration may be given to jointly surveying these activities.

*8.1.7. Quality issues*

Identifying and maintaining constant quality publishing service activities is challenging. It can also be difficult to identify where a change to service quality occurs and to appropriately quality adjust in response.

In the case of books, service quality can be linked to the type of book and to its physical characteristics. Therefore when a specific book is no longer offered for sale, a replacement title may be selected, and quality adjusted for, on the basis of, for example; the author, the type or genre of book (literature, science, cooking), the target reader (academics, adults, children), the number of pages, the number of pictures and the type of binding. In the compilation of the SPPI for publishing activities in France, a quality (size) adjusted price is calculated by dividing the price of a book by the square root of the number of pages (following the method used in the compilation of the CPI).

For newspapers, it may be difficult to measure quality and to identify quality change. Changes to format, size, the amount of colour print and the space given over to advertising could all be monitored to identify changes in quality. However, it is unclear as to how the quality of journalism and editorial content can be adjusted for. Newspapers and magazines may periodically include a free gift (for example a CD, another publication, book or toy) without a change to the price. Again, it is not clear as to the appropriate quality adjustment that should be performed for these gifts.

#### **8.1.8. *Weighting and aggregation***

The choice of weights used for weighting and aggregation will depend on the availability of reliable source data. Different data sources can be used, such as turnover data collected through a dedicated turnover survey, weighting data provided by an external supplier, National Accounts input/output tables or a combination of the above data sources. Ideally, each service transaction will be assigned its own weight. The weighting structure below industry level will depend on the chosen classification structure, based on standard classifications and perhaps modified or extended to take account of the national organisation of the industry.

#### **8.1.9. *Specific aspects***

Published material is increasingly being sold through electronic format. The growing importance of importance of electronic editions of newspapers and magazines and “e-books” should be an important consideration in the design and maintenance of the SPPI. For example in France, digital books are now priced separately to paper books.

#### **8.1.10. *Overview of national methods***

A small number of countries (U.S., U.K., Sweden, Slovenia, Japan, and Israel) calculate an SPPI for publishing activities. The U.S. is currently the only country that includes prices for licensing activities in its SPPI. Typically compilers focus on books, newspapers, journals and periodicals. The decision as to include or exclude advertising prices depends on whether or not the measure of output of publishing activities includes output generated from advertising activity.

### **8.2. Software publishing (David Friedman, U.S. Bureau of Labor Statistics)**

#### **8.2.1. *Industry description (ISIC 5820)***

Business enterprises in this industry engage in computer software publishing, publishing and reproduction, and operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation, and providing support services to software purchasers. They may design and develop software in conjunction with publishing it, or may only publish software without being



engaged in its design or development. The creation of customised software designed to meet the needs of specific users is excluded from this industry.

Business enterprises in the software publishing industry sell licenses that grant customers the right to use standard (non-customised) software programs. These programs are designed for use on personal computers, servers, portable devices, video game consoles, and a variety of other computing devices. Software may be provided by physical transfer on discs or cartridges or by download. Software publishers provide services such as technical support, product updates, consulting, implementation, and training services in addition to software licenses. Many software publishers offer these services bundled with the software license in the form of a maintenance agreement. Maintenance agreements are often charged as a percentage of the original license price. Most software publishers require customers to purchase one year of maintenance at the time the license is initially purchased. After the first year of maintenance is completed, customers are given the option to renew the maintenance agreement. Since “first-year” maintenance is typically bundled with the initial sale of the software license, first year maintenance and the software license are collected as a single transaction price and are captured in the primary service line corresponding to the appropriate software license category (other application software publishing, etc.). However, sales of renewed software maintenance services are captured in the primary service line entitled Software maintenance, technical support, training, and other services related to software publishing because they are priced separately.

Some software firms may provide technical support, consulting, or training services for third party software. Turnover earned from providing these secondary service activities for third party software are outside the scope of this industry, since the service provider is not the owner or originator of the intellectual property associated with the software. Turnover generated in this way is collected as other receipts.

There are two main categories of software: system software and application software. System software includes programs that instruct computer hardware and other software applications in how to operate. Examples include software for operating systems, networks, database management, and development tools and programming language software. Application software includes programs that complete specific tasks or functions. Examples of application software include word processing, spreadsheet, accounting, and game software.

In recent years, this industry has faced increased competition from firms that provide online access to hosted software on a subscription basis and also firms that provide open source software. Unlike traditional software licenses, open source software source code can be copied, altered, and redistributed free of charge. Firms that offer open source software typically distribute free programs to their customers and earn revenues only by providing support services, such as implementation and consulting.

### *8.2.2. Classification aspects*

#### *8.2.2.1. Industry classification*

Software publishers are classified in ISIC group 582. This group includes publishing of the following types of ready-made (non-customised) software:

- Operating systems;
- Business and other applications;

- Computer games for all platforms.

Excluded from this group are the following:

- The reproduction of software without publishing (classified in ISIC 1820);
- The retail sale of non-customised software (classified in ISIC 4741);
- The production of custom software (classified in ISIC 6201);
- The provision of online access to hosted software (classified in ISIC 6311).

Annex A provides classifications from various systems by type of activity.

#### *8.2.2.2. Product classification*

Annex B maps the NAPCS product codes for the Software Publishing industry to the CPC structure. The products in the two structures are largely comparable. One substantive difference is that the NAPCS includes more detailed products (cross-industry, vertical market, utilities, and other applications software) for the CPC broad category for other application software. Another difference is that software originals, defined as the sale of copyrighted intellectual property provided on a non-contract basis is included in a separate subject area of the NAPCS structure. This is also the case for on-line games, which are primarily offered by Internet publishers and are included in that portion of the NAPCS structure.

#### *8.2.3. Scope of the survey*

The ideal survey for software publishing measures price changes for the provision of software on a licensed basis and related services provided by the publisher including software maintenance and technical support. Sales of software are priced on a per license or per transaction basis. The major service lines for which the U.S. calculates SPPIs are System software publishing; Application software publishing; Game software publishing; and Software maintenance, technical support, and other services related to software publishing. The U.S. does not publish indices that distinguish between software sold to business, household, or government clients although ideally separate SPPIs should be available for each of these use categories and for exports.

#### *8.2.4. Industry vs. product based SPPI*

Although product based SPPIs are most useful for deflating input-output national accounts, an industry based survey for software publishing that delineates primary production from secondary activities can be used as an acceptable alternative. In the U.S., sampling frames are available by 6-digit NAICS industry (not by product) and services that are not primary to the software industry are considered “other receipts” and given a chance of selection at each sampled company. When publication criteria are met, a price index for these “other receipts” is published. These “other receipts” contribute approximately 15% of total software publishing industry turnover according to the U.S. Census Bureau. Since turnover for secondary activities is significant, it is important that these activities are collected and published separately. Some examples of common “other receipts” for the software publishing industry include the provision of web hosting services, including the provision of access to hosted software, the sale of computer hardware, and technical support, consulting, or training services provided for third party software.

### 8.2.5. *Sample design*

Probability proportional to size sampling with turnover or number of employees as the size measure should ideally be employed for this industry. Due to the rapid rate of product innovation inherent in the software publishing industry, it may be necessary to update the sample of firms more frequently than for other industries. An alternative strategy may involve augmenting the initial sample with firms that were either not in existence when the initial sample was drawn or that did not generate significant turnover at that time but have since grown. Surveying firms in the sample periodically to solicit price information for new products (ones that have been introduced since the last sampling) should also be considered.

### 8.2.6. *Collection of information and specification of the service*

In the U.S., prices are collected directly from respondents. When establishments join the survey, they undergo face to face initialisation interviews with data collectors in order to select representative transactions and collect initial prices. Financial officials at headquarters locations are often the best contacts, particularly when collecting unit value prices.

Data collectors select representative transactions based on products' relative contributions to total firm turnover. The first stage of transaction selection distinguishes between the sale of software licenses and sales of other related services, including training and support services transacted separately from the license sales. For software license items, the next step of probability-proportional-to-size disaggregation is based on the type of software sold (operating system software, database management software, desktop and portable device application software, game software, etc.). Once a type of software is chosen, selection proceeds between individual software programs within the selected category.

The following transaction characteristics are recorded for each software license item:

- Name of software;
- Type of software;
- Type of client purchasing software;
- Software version number;
- Date current software version was introduced: This information is used to help determine when directed substitution to a new software program may be needed. Directed substitution is a strategy that may be employed to update the product sample more frequently. Items that have not had new versions introduced for an extended period typically are products that are experiencing sharply declining sales. These items are the best candidates for a targeted substitution effort, where respondents are asked to provide a newer software program that has gained or is gaining market share in place of the one that is declining in the market;
- Type and number of licenses included: Some transactions may consist of the sales of both server based and client based licenses. The server licenses may be transacted based on the number of central processing units (CPUs) required to run the software program on each server machine on which the software resides;

- Duration of licensing agreement: Many software sales are for perpetual licenses with no defined term. Other sales may grant the use of a license for only a specified period;
- Bundled services included: One year of software maintenance is often included with certain software license sales. In these cases, the price for the bundled maintenance is included in the item price. Training, documentation, and other services may also be sold in a bundled transaction with the license.

The following transaction characteristics are recorded for sales of services transacted separately from software licenses:

- Type of service provided;
- Duration of service;
- Location where service is provided: This characteristic is particularly important for software training services. Higher prices are typically charged for training services performed at a client's worksite;
- Name and type of software for which that service is provided.

#### ***8.2.7. Main pricing methods***

The most common types of prices collected for this industry are unit value prices, component prices, direct prices of repeated services, and model prices.

##### ***8.2.7.1. Unit value***

Unit value prices are calculated by dividing the total turnover earned from all sales of a particular type of license for a specified software product made to a given buyer type (end-user, retailer, wholesaler, or original equipment manufacturer) by the total number of these licenses sold to these buyers within a specified period. An alternative way that this price may be calculated is by applying an average discount to the list price for a selected software license sale. The average discount is calculated by comparing the turnover generated from all sales of a specified license to the turnover that would have been generated if each of these transactions were made at the listed price.

The benefit of the unit value method is that it captures all discounting and reflects the period to period changes in software pricing caused by changes in both market demand and firms' marketing and sales strategies. This is especially important for this industry, since software has virtually no marginal production costs and consequently is often heavily discounted in order to generate sales. A significant disadvantage of this method is that it may lead to lags in data reporting, since these unit values are often not available until after the pricing period has been completed. In addition, unit values may change due to shifts in the mix of buyers that purchase the software in each period. While a unit value should be limited to include only sales to a particular type of buyer, there may still be variation within that defined category. For example, a unit value of all perpetual license sales of a specified product sold to original equipment manufacturers may be collected. From period to period, there may be shifts in the mix of large manufacturers and small manufacturers that purchase the product. Since large manufacturers typically receive the lowest prices, unit value prices will tend to fall in periods when they purchase large quantities of the product.

#### *8.2.7.2. Component pricing*

Component prices may be used when pricing software sales to large enterprise end-users. These transactions often consist of the sales of both server based and client based licenses. The server licenses may be transacted based on the number of central processing units (CPUs) required to run the software program on each server machine on which the software resides. In addition to these license sales, a typical enterprise software transaction also includes the sale of a year of software maintenance. An enterprise software transaction priced using the component method may, for example, consist of the sale of eight CPU licenses, 100 client device licenses, and one year of software maintenance.

#### *8.2.7.3. Direct use of prices of repeated services*

Prices of repeated services are collected for products that are regularly transacted in each pricing period. This includes sales of mass marketed software offered through the retail distribution channel.

#### *8.2.7.4. Model pricing*

Model prices are collected for products that are transacted infrequently or that have significant price variation between different buyers. Since software products may be sold at substantially different prices based on the timing of the sale and the negotiating skill of the buyer, it is often difficult for respondents to estimate the prices that would be charged if a particular software sale were to occur. This is a significant disadvantage of model pricing.

#### *8.2.7.5. Combination of the model pricing and the percentage fee methods*

In pricing software maintenance contract renewals, the United States employs a combination of the model pricing method and the percentage fee method. The following characteristics are collected in the base period:

- The software licensed;
- The original license price, including the cost of first year maintenance;
- The month and year of the original sale;
- The percentage of the license price charged for renewed maintenance;
- Any applicable discounts.

In subsequent re-pricing periods, the software licensed is held constant, and the time between the original sale of the software license and the maintenance renewal is held fixed at twelve months. For each reporting period, SPPI compilers escalate the price of the original software license sale and corresponding first year maintenance by the appropriate PPI Software publishing index to provide the respondent with an estimate of what the price of the initial purchase would have been if the selected software license transaction had occurred twelve months prior to the reporting month. For example, a maintenance renewal transacted in October 2012 would reference a software license sold in October 2011; during the November 2012 reporting period, the U.S. provides the respondent with an estimate of what would have been charged for the same software license in November 2011. The respondent uses these escalated values to calculate the

price that would be charged in the current reporting period to renew maintenance for a second year.

### 8.2.8. *Quality issues*

Newly released versions of software programs typically have increased functionality and new features, and are not therefore directly comparable to the previous versions. If possible, the price basis of the software is adjusted by using production cost data in order to account for the change in quality when a new software version is released. The production costs for software publishers primarily consist of the research and development (R&D) costs associated with the enhancements made to new software versions. Note that consumer utility of the increased functionality and new features is appropriately not considered when adjusting the producer price index for quality change. Respondents are asked to estimate the development costs associated with the enhancements made to the new software version. These costs are then divided by the number of units of the new version that are expected to be sold. If this number is not available, the costs are instead divided by the number of units of the previous version that were sold, since this is considered the best available proxy for expected sales of the new version. The calculated per unit development costs are then used to quality adjust the item when the new version is released.

### 8.2.9. *Weighting and aggregation*

Table 8.2.1 lists the industry indices the U.S. calculates for the Software Publishing industry.

**Table 8.2.1. U.S. indices for the Software Publishing industry**

Index code	Index Title
511210	Software publishers
511210P	Primary services
5112105	Software publishing, except games
511210501	Systems software publishing
511210502	Application software publishing
51121050201	Desktop and portable device application software publishing
51121050202	Other application software publishing
511210503	Technical support, training, and other services related to software publishing
5112106	Game software publishing
511210SM	Other receipts

A distinct index for all software publishing with the exception of games is provided to assist with the deflation of gross fixed capital in the national accounts (2008 SNA, p. 207). While the sales of systems and applications software are included in the fixed investment accounts, sales of games software are included only as personal consumption expenditures.

For each of these index series, the lower level indices are aggregated using industry turnover data as weights. Within the lowest level indices, each item is weighted based on company turnover provided at the time of data collection.

### 8.2.10. Specific aspects

The fast pace of technological change creates a large challenge for pricing constant-quality services in this industry. Software publishers are continually updating their service offerings to adapt to changing computing environments. The increased capacity of Internet applications and the rise in the use of portable computing devices have accelerated these changes. As a result, frequent item re-sampling and a strong emphasis on quality adjustment are often employed for software publishing SPPIs.

### 8.2.11. Overview of national methods

#### Canada

Canada does not currently collect price information directly. Prices are instead estimated based on the following data collected directly from responding firms: turnover, personnel expenses, and the average annual percentage change in labour rates.

The estimated price is calculated as follows:

$$\text{Price} = \text{Net Multiplier} * \text{Average \% change in wages}$$

Where:

$$\text{Net Multiplier } t = \frac{\left( \frac{\text{Turnover}_t}{\text{WageExpense}_t} \right)}{\left( \frac{\text{Turnover}_{t-1}}{\text{WageExpense}_{t-1}} \right)}$$

The wage expense in the Net Multiplier is defined to be the total wages of employees and contractors.

The average change in wages is defined to be the weighted average change in wages for employees and contractors and is defined by the following equation:

Average % change in wages =

$$= \left( \text{Weight}_t^{\text{employees}} * \text{Average\_wages\_employees} \right) + \left( \text{Weight}_t^{\text{contractors}} * \text{Average\_wages\_contractors} \right) \text{ Where the weights are given as:}$$

$$\text{Weight}_t^{\text{employees}} = \frac{\text{Wage}_t^{\text{employees}}}{\text{wage}_t^{\text{employees}} + \text{wage}_t^{\text{contractors}}}$$

$$\text{Weight}_t^{\text{contractors}} = \frac{\text{Wage}_t^{\text{contractors}}}{\text{wage}_t^{\text{employees}} + \text{wage}_t^{\text{contractors}}}$$

#### Germany

According to a European regulation on short term statistics, Germany is obliged to provide SPPIs for the division 62 and group 63.1 of the NACE classification. As with other SPPIs, the Federal Statistical Office followed a two-phase approach for collecting the necessary data. The first step consisted of a paper based survey designed to validate the sample and to provide the necessary data for the weighting pattern – effectively a respondent initialisation survey. The second phase consists of the survey for the current period price observations. The industry representative organisations were contacted to discuss the organisation of the industry. These contacts confirmed that the services offered by classes 58.29, 62.00, and 63.10 often overlap. In order to capture additional information about the main and secondary activities of the market actors, the first phase



survey was expanded to a sample of enterprises classified as software publishers. Table 8.2.2. summarises the weighting results for products of the three classes mentioned above.

**Table 8.2.2. Weighting results for CPA-products for Other software publishing (NACE 58.29), Computer programming, consultancy and related activities (NACE 62.00), and Data processing, hosting and related activities; web portals (NACE 63.10)**

CPA-Product	Description	Industry (NACE)		
		58.29	62.00	63.10
5829	Other software publishing services	51.8 %	16.5 %	17.0 %
6201	Computer programming services	8.7 %	23.5 %	10.6 %
6202	Computer consultancy services	39.5 %	34.7 %	19.9 %
6203	Computer facilities management services	0.0 %	9.2 %	18.9 %
6311	Data processing, hosting and related services	0.0 %	16.0 %	33.6 %

As a compromise, the Federal Statistical Office publishes product based SPPIs as well as industry based SPPIs. The product based SPPIs incorporate the price development of service providers from all three of the above mentioned industries. The weighting schemes are derived from a sample including units from each of the three industries. The industry based SPPIs are aggregations of the product based SPPIs - according to their weights within the industry.

### *Hungary*

Hungary uses a cut-off sampling selection method (with a combination of number of employees and turnover) for large companies. In the case of ISIC class 5820, the sample is expanded by random sampling for smaller enterprises due to smaller companies accounting for greater than 60% of industry turnover.

Hungary employs the unit value, direct use of prices of repeated services, and component pricing methods for this industry.

Hungary employs two sources of turnover data for weighting. For its product based SPPI, turnover data are obtained at the 6- and 4-digit CPA levels from the annual CPA survey. For its industry based SPPI, turnover data from two years prior are obtained at the 4-digit and higher levels from the Structure Business Statistics (SBS) survey. Weights and samples are updated annually.

Lower level (CPA 6-digit) indices of companies are first calculated as un-weighted geometrical means. Next, the company's class level (CPA 4-digit) aggregates are computed as a weighted arithmetical average, followed by sub-indices for "big" (weighted) and "smaller" (un-weighted) companies, which are aggregated using the turnover share of the industry SBS data.



### *Japan*

Japan uses the direct use of prices of repeated services method for their price indices on packaged software. Japan employs the production cost method for quality adjustment.

## **8.3. Telecommunications (Christopher Jenkins, Office for National Statistics U.K.)**

### **8.3.1. Industry description (ISIC 61)**

Telecommunications is a very dynamic service industry, susceptible to rapid changes in technology and customer movement to new services. It is one of the more challenging services to accurately capture current price changes for. Globally there is movement towards communications convergence, resulting in the integration of telecommunications services with IT services (telephone, computer and television). This makes both an industry-structure model and a representative weighting pattern difficult to establish and maintain.

Business enterprises classified to this division engage in a wide range of activities which include providing telecommunications and/or video entertainment services over networks (which they either own or lease) and client supplied high speed internet connection. Establishments can be classified into one of four industry groups depending on the type of telecommunications services they offer. The first three groups relate to the provision of telecommunications services using transmission facilities and infrastructure that they own or lease. The distinction between these groups is the type of infrastructure that is operated (wired, wireless or satellite). The owners of the infrastructure, known as network operators – sell their services both to final consumers (businesses or households) and as inputs to service providers that resell these services to final users. The fourth group relates to those establishments that primarily provide telecommunications support services.

The industry is capital intensive, with very high start-up costs required to cover the construction of base stations and user networks as well as the acquisition of telecommunications licenses. Consequently, individual markets are often dominated or at least heavily influenced by one or a few large service providers.

Traditionally, telecommunications services were priced according to the duration of service consumption (such as cost per minute). However, as the industry develops and competition increases, telecommunications service providers are developing alternative pricing packages in order to win new customers. Bundled services are becoming a popular way to provide, and thus charge for, telecommunications services. By bundling more than one service product, telecommunications providers can offer customers a price structure that provide financial (or other) benefits that are contingent on the consumption of any or all service elements included in the services bundle.

When measuring the price of a bundle of services, two main alternatives are available to the price index compiler: *i*) break down the bundle into separate services and price these separately; or *ii*) price bundled services together as a single product. Note that the pricing method used in each case will be dependent on what data is available. More detail on the pricing methods used for this industry is provided under Section on pricing method.

Under the first option, it is important not only to specify and price each component separately but also to measure the financial or other benefits provided to customers who subscribe to bundled services. Financial benefits are relatively easy to identify when

pricing bundled services. However, pricing other benefits is more complicated. In addition, breaking down bundles and pricing each sub-component separately will translate into heavy response and calculation burdens. One possibility for minimising burden involves letting respondents choose the service bundles that are most representative of their business in terms of revenues. The sub-components of these bundles are then priced separately.

Under the second option, only the prices of the bundled services and their corresponding service specifications are required. Since the underlying services are not priced under this approach, the response and calculation burdens are reduced. Keeping the bundles representative over time is a significant concern and requires that bundled services are updated regularly. Updating of bundled services should be accompanied by appropriate quality adjustment. It should be noted that quality adjustment is also required when pricing the service components of the bundle separately (option i).

### *8.3.2. Classification aspects*

#### *8.3.2.1. Industry classification*

The three main international industrial classifications, ISIC, NACE, and NAICS are fully consistent at the class/group level; however, below this level there are some slight differences in the detail provided.

The most broadly used classifications are the international classification system of economic activities ISIC and NACE. These classification systems are identical for division 61 which is located under section J - Information and communication, in both hierarchies and includes the activities of providing telecommunications and related service activities, *i.e.* transmitting voice, data, text, sound and video. The transmission facilities that deliver these activities may be based on a single technology or a combination of technologies. The commonality of activities classified in this division is the transmission of content; the creation of content is excluded. The breakdown of division 61 is based on the type of infrastructure operated (Camus, 2009<sup>3</sup>). In the case of transmission of television signals this may include the bundling of complete programming channels (produced in division 60) into programme packages for distribution.

Under the NAICS classification, the description of class 517 - Telecommunications is identical to the ISIC and NACE descriptions. The first three groups are comprised of providers that operate transmission facilities and infrastructure which they own and/or lease, and provide telecommunications services using those facilities. The distinction among the first three industry groups is the type of infrastructure operated (*i.e.* wired, wireless, or satellite). The fourth industry group is comprised of providers of support activities, telecommunications reselling services, or many of the same services provided by those in the first three industry groups, but who do not operate as telecommunications carriers. Business enterprises primarily engaged as independent contractors in providing these services may be classified in other sectors (*e.g.* construction, administrative and support services, food service and drinking places) according to their primary activity.

#### *8.3.2.2. Product classification*

The international product classifications are not as closely harmonised. The CPC is the main product classification system applicable for this industry and the relevant categories are:

- 841 - Telephony and other telecommunications services;
- 842 - Internet communication services;
- 8463 - Broadcasting, programming and programme distribution services.

There are 15 different subclasses for the telecommunications services with a breakdown according to technical criteria.

The product classification for the industry within the European CPA system is more detailed than, broadly comparable to, the CPC

The NAPCS provides an even greater level of detail than the CPA, including products such as installation services for telecommunication networks and network design and development services.

Although the activity and product classifications cover the services of the industry in general, some flexibility is needed to ensure that service products used in SPPI compilation reflect adequately the real service structure of the industry. The current product groupings for telecommunications are largely influenced by marketing, technological and regulatory considerations.

The appropriate level of service product classification for an SPPI often depends on the pricing method applied. When the unit value method is applied, the lowest level of service product detail is dictated by the available revenue and quantity data. Where the component pricing method is applied the structure of published service-rates will dictate the level of service product detail.

### *8.3.3. Scope of the survey*

Ideally, the SPPI for the telecommunications industry should cover the production of all resident telecommunications service providers in the economic territory. It should measure constant quality price change for the full range of output to all intermediate and end users (business, household, government and export).

However, the provision and collection of price data for each of these users is likely to prove difficult and resource intensive. With this in mind the compiler may choose to make use of CPI data as a proxy for the BtoC component of a BtoAll index. It should be noted that taxes, such as VAT, are included in the prices collected for a CPI. The compiler will need to balance the conceptual requirements of the 'ideal survey' against the cost and burden of collecting and processing the necessary data.

In Hungary, it is proposed to develop a BtoAll SPPI by weighting together separate price indices for the BtoB component (as collected quarterly in the Hungarian SPPI) and BtoC component (as collected monthly for the CPI). Adjustments are required for the CPI data to convert the prices to a quarterly series and to potentially adjust for any differences in the conceptual basis of CPI price data (such as the inclusion of taxes). This proposal is still under development and evaluation.

### *8.3.4. Industry vs. product based SPPI*

If the primary objective for the development of an SPPI is to deflate national accounts data, then a product based SPPI would be preferable for the ideal survey. However, in reality compilers very rarely have a sample frame (or turnover data) according to the products produced in this industry (although in some cases it is possible that an industry regulator will have sufficiently detailed information on revenue by product). This data is

more typically available at the industry level in which case the statistical agency can produce an industry based price index that covers only the primary output of the telecommunications industry. Whilst this industry based approach is more practical, it has the disadvantage that it will miss any secondary activity of those establishments classified outside the telecommunications industry. In countries where this secondary activity is of a notable industry based index may be biased.

In the early stages of index development it is recommended that the compiler investigates the likely size of secondary activity that would be missing if an industry based approach was taken. Such investigation could involve discussions with industry regulators and those establishments within the industry. Based on this research, the compiler will then need to balance the additional resource and costs in producing a product based index against the concession in quality that an industry based index may produce.

#### ***8.3.5. Sample design***

In countries where the telecommunications industry is well regulated, the regulatory authority should be able to provide the compiler with information on the market structure of the industry and the relative importance of telecommunications service components. The structure of the telecommunications industry is likely to be similar across most countries with a small number of large service providers dominating the market.

With this in mind, the ideal survey for telecommunications would employ PPS sampling. Options for stratified sampling, using turnover (or some other size measure) as the stratification variable, may also be applied to improve the efficiency of the sample through reducing variance. If the telecommunications industry is recognised to be led by a small number of dominant suppliers, a mixture of non-probability and random sampling may also be considered. This could ensure that the most representative and leading service providers are always included in the sample, with the remaining providers sampled randomly.

Due to the rapid rate of technological development in this industry, the sample may need to be updated more frequently than for other service industries. It might, for example, be appropriate to update the sample on an annual basis to ensure the survey remains representative.

In the U.K. where the unit value approach is employed, a census of data is received for each survey period from the U.K. industry regulator “The Office of Communications (Ofcom)”. In Hungary, the SPPI sample is selected from Hungarian Central Statistical Office business register at the NACE class level. Hungary uses a cut-off sampling method, where a census of units is taken above a predefined size threshold (based on turnover of the enterprise) and below this level a random sample is used.

#### ***8.3.6. Collection of information and specification of the service***

The timing and frequency of price collection for telecommunications services will depend on a number of factors that the compiler will need to assess when developing the index. An important consideration will be the proposed pricing method and the availability and periodicity of input data. For example, if a compiler chooses to take a survey approach, the timing and frequency of data collection will need to be evaluated against the availability of data and potential burden on those who will be providing the data. Likewise, if administrative data is to be collected from an industry regulator, an

appropriate frequency for price delivery needs to be negotiated that allows adequate time for data cleaning, analysis and derivation of the price index. In the U.K., administrative data (turnover and volume data) is received from the U.K. telecommunications regulator every quarter in time for the publication of a quarterly SPPI.

#### *Options for data collection*

In order to construct a price index for the telecommunications industry it is necessary to accurately capture specifications for telecommunications services, including the type of price, the unit of measure, the size of, and reason for price change. Administrative data, survey data, prices collected from the internet and prices collected for the CPI can all be used in the calculation of price change for the industry.

#### *Administrative data*

Administrative data can be accessed either directly from establishments or from a third party, such as the industry regulator. The quality of administrative data can vary between periods and may contain a significant number of outliers and erroneous values. A considerable amount of data cleaning might be required. The trade-off between data quality and data availability could prove to be significant. As such, administrative data for constructing a telecommunications services price index may prove to be unreliable and difficult to manage. However, as discussed in the previous section, the data source may be more suitable for sampling and weighting purposes.

#### *Survey data*

The data source used in compiling a price index is often an important determinant of the pricing method employed. For example, administrative data or tax data that contains income statement variables (revenues and expenses) might be more suited to a unit value methodology whereas transactions prices can be collected directly from a survey. Of the countries currently producing price indexes for the telecommunications industry, 21 of 25 collect price data through a survey while 5 countries compute unit values, although in the U.S. and Germany these data (turnover and quantity) used to compute a unit value are collected through a survey (survey data and unit value methods are not mutually exclusive). In the case of the U.S., both the transaction and unit value approaches are employed.

**Table 8.3.1. Summary of the Pricing Method for Telecommunications SPPI**

Price Method	Number of countries using the method	List of countries using the method
Transaction	8	AUS, FIN, HKG, JPN, KOR, NOR, CHN & U.S.
Unit Value	3	CAN, ESP, FRA U.K., DNK, GER, U.S. & AUT
Transaction & Model	1	CHE
List	4	CZE, POL, SVK & SVN
List or Transaction	4	MEX, NZL, SWE & ITA
Model/Unit Value/List	1	NLD
Total	26	

Note – this table has been compiled using the most up-to-date information available at the time of writing this Guide. It may not accurately reflect the latest situation in each country listed.

These statistics and the shortcomings of the administrative data (described in the previous section) suggest that a price survey approach is often the most appropriate method for collecting price information in this industry. The survey approach will allow the compiler full control over the level and periodicity of data collected. Due to the complex nature of telecommunications products it is strongly recommended that the compiler considers an initial face-to-face meeting with respondents during the respondent initialisation process in order to select representative items and collect the initial price specification and base price (if using survey method).

#### *Internet pricing*

An alternative to conducting a survey is to use data that is readily available from the internet. Although a considerable amount of data are available on-line, they are often list prices rather than actual transaction prices (taking account of discounts etc.). Another concern around the use of internet pricing is the potential for service providers to change the content or presentation of the information they provide on their website. This implies a potential risk to regular index production.

### **8.3.7. Main pricing methods**

There are a number of pricing methods that could be employed for the telecommunications industry - each with positive and negative aspects. According to the Voorburg Group Sector Paper on telecommunications (Camus, 2009) the most commonly used pricing methods for this industry are the component pricing method (bill or rate) and the unit value method. In this section, the merits of each method are considered. Other methods which the compiler may wish to consider when developing an SPPI for the industry are also introduced.

#### **8.3.7.1. Component pricing**

The component pricing with fixed service structure (or bill) method assumes that a set of representative telephone bills and prices is available throughout the lifetime of a business telecoms index. The bills in a base year could be used to define the set of services used in a base year and generate the weighting pattern. This approach is valid if the price changes are the only movement in the index and there is no change in the service use. The respondent would be asked to provide the price updates on the bill and the associated discount information. A disadvantage of this approach is that the use of one service on the bill may affect the discount (and hence price) of another service on the bill

(particularly with bundled services) which would require informed (and unlikely) knowledge on the part of the respondent. This approach places a large burden on the survey respondent and has been shown to bias the survey response to smaller, less complex bills.

If the bill method of component pricing is likely to prove too burdensome then the 'rate method' is an acceptable alternative. The concession with the rate method is that respondents no longer have to re-evaluate bills for individual service components, but instead provide updated tariffs or rates for a completely specified service (with the price determining characteristics held constant over time). The disadvantages of the rate method are the same as for the bill method (but the respondent's burden is lower). A further disadvantage of both component pricing methods is the assumption of no change in service in this industry, which is quite unrealistic considering the pace of technological change of telecommunications services.

#### 8.3.7.2. *Unit value*

The unit value method is implemented by obtaining a unit value price at the lowest level of aggregation, which is the ratio of revenues to quantity for a homogeneous group of products. The unit value method can only be applied if the homogeneity requirement can be satisfied. In some cases confirming and maintaining this homogeneity can be difficult. To achieve a unit value, the revenue of a specified service is divided by the appropriate quantity for the service (*i.e.* minutes, number of flat rates, gigabytes). The yielded unit value is multiplied by its base weight and aggregated within service groups. In effect, the unit value method can be considered to be the component pricing method on a 'per unit of service' basis. As with rate information, telecommunications providers record the value and volume measures for their own analysis, which minimises the respondent burden of the survey. Value and volume data may also be provided by regulatory authorities.

Compared to the component pricing with fixed service structure, a benefit of the unit value method is that it generates no bias towards smaller accounts caused by respondents favouring the reporting of less complex bills. The unit value approach also offers advantage over the component pricing in that it captures price change when services are bundled together. Neither version of component pricing captures these price changes, when the service price varies depending on usage.

A disadvantage of the unit value method is that the mix of service-products in groups does not satisfy the strict requirements of a Laspeyres index. A unit value approach will not guarantee a pure measure of price change, but will provide an approximation. The unit value method also requires cooperation of telecommunications services providers and/or industry regulators for the supply of data. A further complication to consider where administrative data is the main data source is maintaining homogeneity of services provided over time. For example, differences in access, technology, upload and download speed and changes in monthly download limits can be difficult to assess within the unit value method. These changes should be properly accounted for in index compilation.

#### 8.3.7.3. *Direct use of prices of repeated services*

The main advantage of this pricing method is that it surveys real transaction prices (which may also be list prices) and in dynamic industries it can easily identify any potential changes in quality. This method can only be applied when services can be directly observed or measured, which should be the case in the telecommunications



industry. Prices can be collected either via a traditional survey approach or internet pricing. A key point with using this method is that the product specification identified in the initial collection period needs to be as detailed as possible to ensure the price determining characteristics are captured and held constant over time. This is especially important in the telecommunications industry where a typical service being measured will likely include a bundle of options (such as a fixed amount of talk time, download limits etc.). By ensuring the specification adequately captures this information the compiler can maintain the constant quality of the item over time or, where changes to the specification have to be made, adjust the price using an appropriate method of quality adjustment. However, the nature of the services offered in this industry requires the compiler to continually review the representativeness of the specification being priced. New service plans are introduced regularly by service providers, which represent more competitive prices for customers as opposed to changing the price of existing plans. Therefore the compiler needs to ensure it adequately captures this move to new products through regular review of the service specification by monitoring 'too stable prices'. This concept is discussed further at section below on quality issues.

#### *8.3.7.4. Use of CPIs as proxies*

As discussed earlier, this method of price collection could be used for services provided to the household sector if the compiler requires a BtoAll price index.

In many countries, sections of the telecommunications industry are covered by the CPI (such as wired, wireless activities including services via Internet etc.). Assuming there are resource constraints in producing a business-to-all SPPI, the CPI should provide the compiler with a useful proxy for the measurement of price change for all output.

The compiler should consider any potential adjustments to CPI data that may be required to make them suitable for use in the calculation of an SPPI. Particularly, the price data may need to be adjusted to account for a difference in periodicity (for example, CPI prices are collected on a monthly basis in the U.K. but SPPI is a quarterly index) or any changes to tax rates that are included in the price (for example changes in VAT).

The main advantage of using CPI data is the low cost to the compiler. These data are already being collected and should therefore be relatively easy to obtain and process for inclusion in an SPPI. The obvious disadvantage is the difference in conceptual basis on which the prices are collected – there is a risk that CPI price data will not capture the discounting that takes place in the business-to-business market.

#### *8.3.8. Quality issues*

One of the most challenging aspects of developing a price index for the telecommunications industry is to ensure that constant quality is maintained for the price data which is collected. As previously noted, the telecommunications industry is dynamic and susceptible to both rapid changes in technology and customer movement to new services. It is therefore imperative that the compiler takes the necessary steps to ensure any change in quality is both identified and treated appropriately.

The method of quality adjustment used will depend on the chosen pricing method. When considering those pricing methods that measure actual transaction prices (such as component or direct use of repeated services) it is essential that the initial price specification is as detailed as possible to ensure the price determining characteristics are identified and fixed. The subsequent collection of regular price updates should then



attempt to identify any price change that has occurred as a result to the change in the service being offered. This could be carried out in a number of ways. The compiler can simply ask the respondent to report any change in the service specification since the previous period. The compiler may need to follow up with the respondent to fully record the new specification and its impact on the service price. This information can then be used to make an appropriate quality adjustment to the price data.

Alternatively the compiler could choose to use price change as an indicator of potential change in service specification. For example in the United Kingdom SPPI, any price movement of 7.5% or more is queried with the respondent to ensure the price change is genuine and not a result of a change in service. If a change in service has occurred, then the appropriate details are recorded to facilitate the necessary quality adjustment.

The compiler should also take care to check that prices move in line with expectations for the industry. In such a dynamic industry, the expectation should be that prices of telecommunications services are rarely static. It is important therefore to monitor prolonged “no price change” (that is, service prices which have not shown any price change for a number of periods) to ensure that the specification is still representative and the respondent is providing accurate and meaningful price information each period. As a guide, in the United Kingdom SPPI program, any price which has not shown a price movement for 6 periods (the United Kingdom SPPI is quarterly) is queried with the respondent. This period of “no price change” can be set to meet the needs of the price index being developed and initial consideration should be given to likely price variation in the industry. If the price is no longer representative (or the service is no longer provided) then a replacement service is identified and the necessary quality adjustment is carried out.

A final quality consideration for a telecommunications price index is how and when to introduce new services and remove old services from the index. New telecommunications services and new bundles of services are frequently introduced and a regular assessment of the weighting structure used in the compilation of the index is essential to keep up with these developments. When using a base-year Laspeyres index, the introduction of a new service and generation of an associated weight can be difficult, with turnover data sometimes not available for the base year. Equally, exclusion of new services or inclusion of older non-representative services can create a bias in the index which may increase with time. The unit value method can partially reduce the need for a quality adjustment methodology as the use of average, weighted prices can accommodate migrations between services within product classes.

### ***8.3.9. Weighting and aggregation***

The weighting and aggregation of a price index is constrained by the availability of reliable data (such as turnover) with which the compiler can reasonably create a representative weighting structure. For an industry such as telecommunications, where it is recommended that weights are updated on an annual basis, identifying a timely supply of data may prove to be problematic.

There are two main sources of potential data for reweighting a telecommunications price index. A compiler could choose to collect the information directly from the respondent (which is likely to prove burdensome, expensive and untimely) or from the industry regulator (again, this source of data is unlikely to be timely).

In reality, a compiler is unlikely to be able to update the weighting structure as frequently as recommended. Therefore a decision is required that balances the quality of the price index against the availability of data. This may lead to a telecommunications price index that is reweighted more frequently than the standard approach of every five years, but less frequently than the recommended approach of annual updating.

In the U.K., two sources of weights are used to aggregate the SPPI. Firstly, at the elementary aggregate level, a dedicated turnover survey of all respondents providing price data to the SPPI is carried out to collect the corresponding turnover generated for these services in the base period. As the U.K. SPPI is a base weighted Laspeyres type price index, this source of turnover is collected every five years (with the latest survey collecting data in respect of 2010). Due to resource constraints, there are no plans to increase the frequency of this survey.

This source of turnover is used to calculate elementary aggregate weights, which in turn are then used to weight together the elementary aggregate price relatives to produce higher-level indices, up to and including the industry level aggregate.

At the industry level, the U.K. uses national accounts data to derive industry level weights (input/output tables). These weights are then used to aggregate the industry level price movements together to calculate a 'service sector' SPPI, although it should be noted that this aggregate is only representative of the industries which are currently collected by the U.K. This aggregate SPPI is produced on both a gross and a net basis through the adjustment of the industry weights which are calculated. Each industry will be allocated a net industry weight (the net weight for any industry relates only to transactions between that sector and other industries, sales and purchases within industry are excluded) and a gross weight (this covers all transactions).

#### *8.3.10. Specific aspects*

Business telecommunications services change rapidly in their specification. Corporate usage of telecommunications services can also change quickly. An SPPI for the industry should therefore undergo frequent quality assurance to ensure that it remains representative. The following issues could apply:

- Re-weight the service products on a more frequent basis to capture rapid changes in service consumption;
- Research methods of capturing the prices of bundled service products (with discounts) which are increasingly prevalent. These bundled services may include both telecommunications and IT services;
- Pricing bundled services is further complicated where hardware (such as a new phone, router or modem) is included in the final bundle. The bundle should be priced excluding of hardware so that the price index is only capturing services;
- Consideration of what is classified as export (non-domestic) and international services should be carried out. International telecommunications services are usually provided by a host service provider in the external country, but payments are made directly to the host service provider in the host country. For example, if a U.K. customer of a U.K. telecommunications service provider travels to France, any service used in France will be provided by a French service provider. However, the U.K. customer continues to pay for this service via the U.K.

telecommunications provider, who in turn passes on payment to the French provider;

- A final challenge for the methodological development of SPPI for this industry is to consider how to capture the reselling of network capacity as part of other telecommunications activities. This issue seems to be quite similar to those encountered in developing a price index for the wholesale and retail trade services, specifically which pricing method should be used and should a gross or net approach be considered?

### 8.3.11. Overview of national methods

A selection of recent and representative references is provided in the Voorburg sector paper for telecommunications (Camus 2009).

#### *Austria*

In Austria, Statistics Austria, with the help of the Austrian Regulatory Authority for Telecommunications and Broadcasting (RTR GmbH), calculates a quarterly overall SPPI for telecommunications services which comprises fixed link telecommunications, mobile telecommunications services as well as broadband services and leased lines. Satellite telecommunications services have not been taken into account due to their minor market relevance. Due to the structure of the data provided, the index compilation is based on a unit value approach, starting at the most detailed level of aggregation. The unit value obtained, depending on the surveyed service product, is defined as the ratio of revenues in Euro to volume in minutes. The RTR provides quarterly data for the index calculation at the most detailed level possible, as well as the requisite weighting information.

#### *Hungary*

In Hungary, data for business-to-business transactions are collected via questionnaires which are completed by market-leader service providers. The general methodology was developed with the active contribution of respondents and an individual questionnaire for each respondent is produced taking into account the services provided. The survey started in 2007 for fixed line telephony and mobile services, and was expanded in 2010 to include the providers of satellite and other telecommunications services (as a pilot). For the majority of services, the unit value or a combination of unit value and component pricing for well specified services is used to capture price data. For satellite and other telecommunications activities, the contract pricing approach (*e.g.* for reselling network capacity) and direct use of prices of repeated services are used. Price indices for BtoB services are computed and transmitted to Eurostat whilst business-to-all services are under development. For calculation of a BtoAll index, Hungary proposes to use re-processed CPI data to capture the BtoC component and then weight these data together with the SPPI data (using yearly turnover share captured via a special part of the Structural Business Statistics Survey SBS).

#### *Japan*

Japan compiles price indices on telecommunications services including wired/wireless telecommunications and interconnection services for network providers. Indices are focused on BtoB transactions. For wired telecommunications a mix of the direct use of prices of repeated services and unit values methods are used for: fixed telephone services, leased circuits, Internet connection services, and wide area network services. For wireless telecommunications, the model pricing method is employed and

coverage extends to cellular phone services and PHS services. For interconnection services for network providers, the prices of access charges are measured using the direct use of prices of repeated services method.

#### *United Kingdom*

The U.K. index for business telecommunications comprises fixed line and mobile telephony services. Fixed line activity is dominated by a single service provider with other suppliers using the infrastructure of the main supplier. U.K. mobile services are supplied by a small number of evenly sized businesses with their own networks. Other mobile suppliers provide virtual networks by securing airtime from one of the major providers. The U.K. telecommunications SPPI has not been reviewed or updated in recent years. The index is based on a unit-value method. It is compiled from the aggregation of unit-values defined as the ratio of revenue to volume for each homogeneous group of products. Turnover and volume data for the whole market is sourced from the U.K. communications regulator (Ofcom) providing full coverage. The unit-value approach provides a proxy estimate suitable for the telecommunications industry. In addition to minimising bias, it solves the problem of service bundles and escalating tariffs by negating the need to constantly adjust for quality.

#### *United States*

The United States calculates price indices for both wired and wireless telecommunications. For wired services, with the exception of public switched toll service (long distance), the direct use of repeated prices method is used to measure the change in actual transaction prices for specified service packages including all features. If there is a change to any service feature, such as call waiting or the number of video channels, the associated change in provider cost is used to adjust for the change in quality. For public switched toll service, a unit value is the preferred price. The unit value is calculated by dividing total turnover by total minutes for a specified type of call.

For traditional cellular (voice and data) services, the unit value price is calculated as the average turnover per line. To calculate the average turnover, respondents initially provide a user profile based on a specific market area. This profile is based on all service features provided across all rate plans in the given area. Features typically included in the user profile are average local air minutes, roaming minutes and other recurring services. This profile becomes the fixed service being prices, as the average number of minutes for each service feature is held constant in subsequent months. Using the same features in the user profile, each respondent calculates the average turnover per access line for each feature in subsequent periods. Each average turnover value is then multiplied by the corresponding feature in the user profile to derive the average turnover per line. As wireless service providers move from regional pricing plans to nationwide plans in the U.S., prices are to be calculated using nationwide data when available.

### **8.4. Computer programming, consultancy and related activity (Ruth Vizner, Central Bureau of Statistics Israel)**

#### **8.4.1. Industry description (ISIC 62)**

Computer services activities comprise of hardware and software-related services and data processing services. Included are hardware and software consultancy and implementation services, maintenance and repair of computer and peripheral equipment; disaster recovery services, provision of advice and assistance on matters related to the

management of computer resources; analysis, design and programming of systems ready to use and technical consultancy related to software; development, production, supply and documentation of customised software, including operating systems and other support services such as training provided as part of consultancy; data processing services, such as data entry, tabulation and processing on a time-sharing basis; web page hosting services and computer facilities management. Excluded from computer services is the selling of packaged (non-customised) software.

Although there has been a spectacular growth in the provision of computer services over the last decade or so, this has been from a low base, and it remains a relatively small sector in total world trade and income. In 2008, computer and information services comprised 4.6% of total OECD service exports and 3.0% of total OECD service imports. In 2012 the two most dominant countries in the export of computer services were India (\$47.134 billion in exports and only \$2.096 billion imports) and Ireland (\$46.751 billion exports and only \$604 million imports), far more than the U.K. (\$11.479 billion exports and \$5.562 billion imports) and Israel (\$11.329 billion exports and no imports). Germany has a high level of exports, but also a high value of imports in computer services (\$19.981 billion exports and \$17.149 billion imports).<sup>4</sup> The leading countries in the importation of computer services are Germany, the Netherlands and the U.K. The fact that Ireland, although a small country, has gained such a prominent position in this market underscores that trade in computer services is still relatively small in total world trade and income. However, it is a fast growing industry showing an average annual growth of 17.0% in OECD exports between 2000 and 2008 (with only financial services and construction growing faster), and it is the fastest growing industry in respect of OECD service imports, with an annual average growth of 18.7%.<sup>5</sup> Developments in information and communication technology are probably the most important drivers of growth in trade in this industry.

Globalisation or "international economic integration" has expanded trade opportunities and influenced business enterprises in both developed and developing countries. Globalisation has become a fundamental force for growth in computer services as providers attempt to maximize profits and gain competitive advantages, such as reducing labour costs, through geographic arbitrage. Three of the most popular terms used to describe this business model are offshoring, outsourcing and near shoring:

- Offshoring is defined as the movement of a business process performed by a company in one country to a subsidiary or other type of affiliate company in another country. The reason for relocation is almost always a lower cost of operations in the new location. The motivation for offshoring includes access to qualified personnel abroad and an increased speed to market as well;
- Outsourcing refers to the process by which an organisation contracts part of its work to another firm/organisation in another country;
- Near shoring refers to outsourcing service activities to a foreign affiliate or external company that is geographically close.

Offshoring of services has increased in recent times, driven by the liberalisation of services sectors and by technological advances. Improvements in technology, standardisation, infrastructure growth and decreasing data transmission costs have all facilitated the utilisation of services from abroad. Rapid advances in Information Communication Technology (ICT) have also increased the tradability of many service activities and created new kinds of tradable services. In particular, "knowledge work"

such as data entry and information processing services, and research and consultancy services, can easily be carried out via the internet and e-mail and through video conferencing.

The mostly frequently offshored activities are computer services such as software development and Information Technology (IT) services, with more than 50% of companies offshoring their functions.<sup>6</sup> Very often the first jobs to be outsourced were low skilled, such as help desk, back-office and data entry operation. However, over time more skilled jobs and tasks of greater strategic importance for the firms such as network administration, programming, software development and testing, design and system integration have been offshored

The offshoring and outsourcing of Computer Programming and Related Services activities are also important although surveys of multi-national enterprises in several countries (France, U.S., Sweden and Ireland) show that they still only account for a relatively small share of total production.<sup>7</sup>

The three most important motivations for offshoring are: labour cost savings, increased organisational flexibility and access to qualified personnel. Some of the main risks associated with offshoring include: the quality of service, high employee turnover in the offshore service center and concerns about data security.

India's low-cost labour and availability of a large pool of English speaking and technically proficient personnel has made it an offshoring destination for global firms such as HP, IBM, Accenture, Intel, AMD, Microsoft, Oracle Corporation, Cisco, SAP, and BEA. However, wage inflation in India and several other established offshoring destinations has begun to reduce their attractiveness as offshore destinations. India's popularity as the go-to location for product or software development work is declining, while many new destinations, such as China, Canada and Central America (Mexico), are becoming increasingly popular.

#### **8.4.2. Classification aspects**

##### **8.4.2.1. Industry classification**

Under the ISIC classification, division 62 - Computer programming, consultancy and related activities, is an aggregation composed of three industries. Under the NAICS classification, group 54151 - Computer system design and related services, (comparable to ISIC division 62) is an aggregation composed of four industries. The NACE classification for computer programming, consultancy and related activities, is similar to the ISIC classification although it provides more detail (see details in annex A)

While all three classification systems are similar, both the NACE and NAICS classifications specify 'computer facilities management services' as a separate industry, while under the ISIC classification this business activity is combined with computer consultancy.

ISIC 6201 - Computer programming, can be thought of as the production of customised software. Computer programmers write, modify, test, maintain and support software to meet the needs of a particular customer. Services provided may also include customising packaged software to meet a client's specific needs, such as interfacing with other software or business processes. Note that software publishing (pre-packaged 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 62, but instead is included as part of division 58 - Publishing activities.

The primary services classified under ISIC 6202 - 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 third parties. Computer consultants may also install a system, train and support users of the system, and provide advice and procedures for enhancing systems security.

This industry also includes computer facilities management activities which provide on-site (including remote access) management, operation and support services for clients' 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 classified under ISIC Group 631 - Data processing, hosting and related activities; web portals.

ISIC 6209 - Other information technology and computer service activities, includes outputs as diverse as computer disaster recovery services, installation of personal computers and software installation.

It is clear therefore, that turnover for computer programming, consultancy and related activities is generated from a wide range of services.

#### 8.4.2.2. *Product classification*

The corresponding products for Computer programming, consultancy and related activities (ISIC 62) are classified in CPC as follows:

- 831 - Management consulting and management services; information technology services;
  - 8313 - Information technology (IT) consulting and support services (corresponds to ISIC 6202 - Computer consultancy and computer facilities management activities);
  - 83131 - IT consulting services;
  - 83132 - IT support services;
  - 8314 - Information technology (IT) design and development services (corresponds to ISIC 6201 - Computer programming activities);
  - 83141 - IT design and development services for applications;
  - 83142 - IT design and development services for networks and systems;
  - 83143 - Software originals;
  - 8316 - IT infrastructure and network management services;
  - 83161 - Network management services;
  - 83162 - Computer systems management services;
- 873 - Installation services (other than construction);
  - 8733 - Installation services of office and accounting machinery and computers (corresponds to ISIC 6209 Other information technology and computer service activities);
  - 87332 - Installation services of personal computers and peripheral equipment;

A comparison between the CPC and NAPCS classifications shows that NAPCS is much more detailed (see annex B).

Practices in the provision of computer services vary across countries. However, to the extent allowed by market conditions, it is recommended that national product classifications are developed such that they will accord to the generally accepted breakdowns included above. This will increase international comparability, while at the same time facilitating the customised measurement of different products and product groups, where necessary.

#### *8.4.3. Scope of the survey*

The ideal survey will capture price changes in computer programming, consultancy and related activities as a whole, covering ISIC sub-divisions 6201, 6202 and 6209. The decision on partial coverage of the sector depends on the market structure in the country. In most countries group 6201 - Computer programming activities, accounts for the largest share of the total output of the division followed by group 6202 - Computer consultancy and computer facilities activities. Group 6209 - Other information technology services, usually accounts for the smallest share. In practice, most countries that compile a SPPI for the industry cover all three groups with a minority covering only the first (6201) and second (6202) groups.

#### *8.4.4. Sample design*

Sampling can be organised over several levels, meaning that the price observation under consideration may have been chosen as a result of more than one sample selection. For example, a sample of business enterprises is drawn first, followed by a sample of representative services and finally of contracts. Probabilistic, stratified or random, sampling can be used at all levels of sampling.

The Business Register is typically used as the sample frame for SPPI, although the samples for short-term and structural business surveys can also be used as the frame for selecting units. The sample is usually selected at the class level. Stratified sampling, which involves the independent sampling of different subgroups within the frame, can be applied. Units can be selected using various methods such as PPS sampling, random sampling and non-probability sampling. These sampling methods allow for differences in unit sizes to be taken into consideration. In some cases only cut-off sampling is used, in which only units above a certain size are included. By including the larger units, coverage of a significant share of the turnover can be achieved. Probability and non-probability sampling methods can often be successfully combined.

The size criterion for selection of unit is usually either turnover or number of employees or a combination of both. The correlation between the number of employees and the net turnover is often relatively high, which indicates that the number of employees is a reasonable proxy for the net turnover.

The size of the sample is, in practice, determined either by statistical methods or according to available resources. Because of the diversification in services, the sample design should include medium and small size units to cover all kind of services. When regional differences are observed in a price change, the use of geographic area as a stratification variable can be considered.



#### 8.4.5. *Collection of information and specification of the service*

It is important to ensure that respondents provide accurate and representative data. The information provided should represent the diversity of services in the industry and their price development. Ideally, respondent contacts should be senior managers, who command a broad overview of the relevant services and of the industry as a whole. This will help to ensure a high quality and representative index for the industry.

The specification of specific service transactions should include:

- The type and kind of service (*e.g.* software analysis, software programming, software installation, hardware consultancy);
- Details of staff: profession and skill level (*e.g.* senior database programmer, senior system engineer, PC technician), experience (*e.g.* less than 2 years, between 2-5 years, more than 5 years);
- Other specification of the services such as kind of software language (*e.g.* Java);
- Customer type.

Special efforts should be made to identify any changes to the service transaction between the current and previous period. If there has been a change in the service transaction, a quality adjustment should be made to account for this change.

#### 8.4.6. *Main pricing methods*

The selection of the pricing method must take into account the special characteristics of the pricing mechanisms used in the industry. Business enterprises providing computer programming, consultancy and related activities usually charge their clients according to the time spent in providing the service. Charges cover salaries and other costs, and also profit.

##### 8.4.6.1. *Time based methods*

The most commonly used pricing method in this industry, employed in the majority of countries, is the time base method. This method surveys the amount of money charged to a service purchaser for a standard amount of work (*e.g.* one hour or one day) by an employee of the producer, who contributes to the provision of that service.

When using time based methods such as charge out rates, the service specification should be sufficiently detailed and might include the profession level of the staff, their skills and experience, and the project and client types.

The charge out rate is an acceptable method although it does not capture changes in productivity. It is relatively easy for respondents to report hourly rates and respondent burden is minimised. Time based methods are commonly employed for computer programming activities, as they are unique non-repeatable services provided to a specific client.

##### 8.4.6.2. *Model pricing*

Model pricing can also be employed for the provision of unique services. Under this method a standardised representative service is identified in cooperation with the respondent who will then provide a price estimate for the standardised service in each survey period. The model can be based on an actual service provided (ideally recently

provided) or on a fictitious one. When estimating the price for the model, the expert might consider real transaction prices, hours worked, wages, revenues and any other input data

#### 8.4.6.3. *Direct use of prices of repeated services and contract pricing*

For the other groups – Computer consultancy and Computer facilities activities and other information technology services – which have more regularly provided services (such as data processing or the operation of hardware systems), other pricing methods can be used. The direct use of prices of repeated services and contract pricing methods are employed for more regular services, such as security services for networks.

**Table 8.4.1. Pricing methods for computer programming, consultancy and related activity**

Pricing method	Example	Sub-group
Time based	Hourly charge-out rates for chief programmer for analysis	6201
Time based	Hourly charge-out rate for senior database programmer for design and development of the database	6201
Direct use of prices for repeated services	Security services for network	6209
Percentage fees	Percentage of software licenses	6202

#### 8.4.7. *Globalisation effects on SPPIs*

The outsourcing or offshoring of computer services activities presents SPPI compilers with difficult measurements challenges. When part or all of a service activity previously produced in-house (domestically) is outsourced, it is often to a lower cost country, resulting in a change to the transaction price, margin or both. The use of geographic labour arbitrage is not a concern from a SPPI perspective. The question is - has output changed as a result of the shift from internal to external production? As long as the outputs are unchanged, the primary interest of an SPPI is to record transaction prices that are tied to the firm revenue function. If a component of a computer service activity is outsourced offshore, resulting in lower costs for the same service in period 2 compared to the service produced in period 1, the price change should be recorded as a pure price change. If a job or component of a job is outsourced and results in qualitatively different inputs then a quality adjustment to account for the change in output quality is needed. Outsourcing of services has no implication for the classification of the principal companies, even if all of the production process is outsourced. Therefore, the classification of the principal company remains as if they were carrying out the complete service activity in contrast to the outsourcing of the manufacture of products (in which case the classification of the principal company is dependent on whether part or all of the manufacturing is outsourced and on the ownership of the material inputs).

In order to facilitate a better understanding of the effects of globalisation on the SPPI for computer services it may be necessary to collect more information from multinational enterprises, perhaps as part of the SPPI survey. This information might include: the type of services offshored; the process of offshoring; comparison of the quality of the outsourced and domestically produced services; the proportion of their production that is outsourced; the motivation for outsourcing and the identification of other factors that influence the prices of and profit margins for outsourced services.

#### 8.4.8. *Quality issues*

Estimating the value of change in output quality is one of the most challenging measurement problems faced by SPPI compilers. The output of computer programming, consultancy and related activities is dynamic and tends to be customised to the needs of the client. Thus, the initial specification of the service or job that is repeatedly priced will become less representative over time. The ability to explicitly and accurately value quality changes remains challenging.

Implicit quality adjustments are the most commonly used methods for quality change valuations. These include the overlap method and the overall mean, targeted mean and class mean methods. Hedonic techniques do not appear to be a practical option due to a lack of resources, the complexity of consultancy outputs, and the lack of sufficient data.<sup>8</sup>

Changes in the time based prices generally include not only pure price changes but also changes in productivity which should ideally be accounted for in the measurement of price development. In order to facilitate the identification of changes in productivity it is vital that charge out rates must be based on detailed specifications of the work, the type, skills level and experience of staff, the client as well as profit and overhead.

Much work remains to improve the current methods for valuing output quality and compiling constant quality output price indices. Future improvements will require a combination of research, efforts to improve respondent cooperation and more extensive use of expert advice.

#### 8.4.9. *Weighting and aggregation*

The sources of weight data vary among countries. Most countries use data from annual surveys like Structural Business Surveys and Annual Surveys of Services for Computer Services. In some countries, weight data are collected by a specific SPPI survey which is usually conducted as part of the respondent initialisation process. Some countries use National Accounts data and data from input-output tables.

#### 8.4.10. *Specific aspects*

In addition to the measurement issues discussed in the previous section – outsourcing, quality change and the non-observable productivity changes when using hourly rates – there are a number of other issues that present challenges for compilers of SPPIs for this industry.

Intra-enterprise pricing is one such issue. An enterprise may set up an establishment to provide IT services to other units within the enterprise. It can be difficult to collect prices for these intra-enterprise services and they may be of dubious value if they do not parallel the price development for market transactions.

The rapid consolidation of large business enterprises, through mergers and acquisitions presents further challenges. Additionally, the dynamic nature of the services produced may create sampling and classification problems, as well as the need for frequent updating of the sample of business enterprises and the types of services, and a greater need for a quality valuation model.

The export share of the industry is relatively high compared to other industries, and further complicated by the activities of foreign branches and subsidiaries particularly in the context of offshoring, subcontracting and outsourcing.

### **8.4.11. Overview of national methods**

#### *Austria*

In Austria, the collection of prices is by e-mail, fax, post and telephone. Hourly charge out rates by level of staff and type of service are provided by respondents (for example: chief programmer for analysis, senior consultant for consultancy, junior consultant for planning and chief programmer for training). Close contact is maintained with respondents to facilitate the identification of changes in the quality of services.

#### *Canada*

In Canada, the prices collected for the IPSP (Informatics Professional Services Price Index) represent the input costs of labour and the realised profit for the firm. The labour cost is calculated as the weighted average of the firm's contract fees and wage rates for the year, while the profit portion reported is used to derive the realised net multiplier. Both of these inputs are multiplied to arrive at a total price index. Prices are collected annually by e-mail. The potential for using model prices on a quarterly basis to replace the current labour/profit pricing method will be explored in the future.

#### *Czech Republic*

In the Czech Republic, monthly prices are collected by e-mail. Charge out rates type of service and type of job are collected; level of skill and experience will also be accounted for in the future.

#### *Finland*

In Finland, charge out rates are collected using an online questionnaire, and by email.

#### *Germany*

In Germany, the time based (hourly rates) method is employed for computer programming, while the time based and contract price methods are used for computer consultancy and computer facilities activities. The percentage fee method is used for software support (percentage of software licenses). The overlap method is used to quality adjust services.

#### *Hungary*

In Hungary, prices are collected via the internet. The most commonly used pricing method is based on working time (hourly rates or charge per day), taking into account the type of software, and the education and experience levels of staff. For regularly provided services, such as data processing or the operation of hardware systems for the specified period, contract pricing or the direct use of prices of repeated services methods are used. For some other services, such as data backup, the unit value method (or average prices based on contracts) is employed.

#### *Ireland*

In Ireland, hourly rates by staff grade, experience and type of work are collected by e-mail. Implicit quality adjustment methods are employed.

#### *Japan*

In Japan, average charge out rates for specified clients are used to measure the price change of custom software development activities. The direct use of prices of repeated services, the unit value and time based (average charge out rates) pricing methods are

employed for system management and operation services activities. The direct use of prices of repeated services method is used for security services for networks activities.

#### *Korea*

In Korea, the SPPI covers group 6201 - Computer programming activities, and group 6202 - Computer consultancy and computer facilities management activities. The model pricing method is employed for computer programming activities and fee percentages are collected for computer facilities management activities.

#### *The Netherlands*

The Netherlands compiles a quarterly SPPI covering Group 6202 Computer consultancy and computer facilities management activities. Prices are collected using a paper questionnaire and non-response is followed up by email and phone. Realised hourly tariffs (with reference to turnover and the concomitant hours), stratified to function, skill level and experience are used to measure price development.

#### *Norway*

Norway compiles a quarterly SPPI on the basis of average hourly charge out rates by skill level. Prices are collected via the internet.

#### *Slovakia*

In Slovakia, the experimental SPPI for computer programming employs the time based pricing method. Charge-out rates according to professions and skill level of staff are collected. Both paper and online questionnaires are used in the collection of prices.

#### *Slovenia*

In Slovenia, quarterly prices are collected by e-mail. A mixture of direct price of repeated services and time based methods (by type of software, project, and experience and skill level of staff) are employed.

#### *Spain*

In Spain, prices for computer programming activities are collected on a quarterly basis, mostly by email. The time based method (hourly rate) is employed. Distinction is made between different skills and experience of staff, and different products where relevant. The overlap method and expert judgement are used to quality adjust prices.

#### *Sweden*

In Sweden, prices are collected electronically and the time based pricing method is employed, taking account of the experience and skill level of staff. When a service change results in non-comparability, the overlap quality adjustment method is applied.

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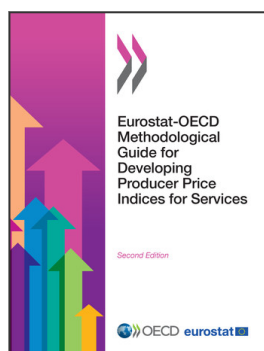
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## Notes

1. In 2011, 13 European countries plus Korea, Japan, and Mexico, operated fixed book price policies for cultural reasons. For more detail on fixed book price policies, see Ginsburgh and Throsby (2006), volume 1, chapter 21.
2. This activity can account for up to half of the revenue of the publisher. Publishers can engage external advertising agencies (73.11 NACE) to sell the advertising space, or (more rarely) sell the space themselves.
3. This section borrows heavily from the 2009 Voorburg Group sector paper on Telecommunications.
4. Source: World Trade Organization, 2012.
5. Source: OECD, 2008.
6. Source: Offshoring Research Network U.S. Survey.
7. Source: Gac, D., *et ali* (2008).
8. Quality adjustment for PPIs in discussed in detail in Chapter 7 of the *PPI Manual*.







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