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Revisited Sector Paper on:

ISIC Rev. 3.1 7421/Rev. 4 7110 Architectural and engineering activities and related technical consultancy

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1.0 Introduction

The Voorburg Group first studied price indices for architectural and engineering activities in 1991 with a report on a study for setting up a price index for consulting engineering services based on model pricing by Statistics Canada.[1] Canada reported more about their SPPI experience in this field in 1992[2] and 1994.[3] After another paper on price indices for engineering services by Norway in 2000,[4] a collection of several approaches towards an engineering SPPI by several NSOs was sampled in 2002 by the US Bureau of Labor Statistics.[5] A paper on architectural services by the Central Bureau of Statistics Israel followed in 2006.[6] The Voorburg Group has not produced papers on the collection of turnover data for architectural and engineering services in the past so that will be covered for the first time in this revisited sector paper

This revisited sector paper identifies the challenges associated with classification of architectural and engineering activities, collection of turnover data, and developing producer price indices. The paper provides some options, highlights challenges and notes the implications of the choices that must be made when endeavoring to develop or revise turnover statistics and price deflators for architectural and engineering activities.

In order to facilitate this paper, a survey was conducted among the member states of the Voorburg Group to track their practices in the field of turnover/output and SPPI statistics for the architecture/engineering sector. 18 countries replied; all survey turnover data; 15 offer SPPI data or are in the development phase.

References are included throughout this revisited sector paper to previous work of the Voorburg Group and other sources. Changes in the conditions for the market of the presented sector occur in a rather slow time; so, this revisited sector paper presents the Voorburg Group's previous work in combination with new developments in the consistent framework of the Sector Paper adopted in 2006 with the adoption of the content development framework.

2.0 Classification

Classification of architectural and engineering activities in both industry and product classifications generally focuses on two primary groups of products or activities: architectural activities, focusing on the aesthetical and functional design of buildings, cities and landscapes, and engineering activities, taking care of the technical design of buildings and other products and services, often involving technical consultancy.

2.1 Industry Classification

[1] Lowe (1991)
[2] Lowe (1992)
[3] Meguerditchian (1994).
[4] Krüger Enge (2000).
[5] Rosenbaum (2002).
[6] Assaf (2006).

Most industrial classifications used by Voorburg Group participants are relatively comparable in the area of architectural and engineering activities at some level of aggregation. ISIC Revision 4 describes "architectural and engineering activities and related technical consultancy" in group 711, class 7110 with no further breakdown. Together with technical testing and analysis, it forms division 71.

The regional and national industry classifications – mostly based on ISIC - make finer delineations. For example, NACE Revision 2 identifies separate classes for Architectural activities (71.11) and Engineering activities and related technical consultancy (71.12). NAICS, as configured for the United States and Canada, puts the services into group 5413 (architectural, engineering, and related services), further broken down into architectural services (54131), landscape architectural services (54132), engineering services (54133), drafting services (54134), building inspection services (54135), geophysical surveying and mapping services (54136), surveying and mapping services (except geophysical, 54137), and testing laboratories (54138). While 54131 and 54132 equal NACE 71.11 Architectural services and 54133-54137 are the alter ego of NACE 71.12 engineering services and related technical consultancy, 54138 is not be considered an architectural and engineering activity, but technical testing and analysis (NACE 71.2, ISIC 712) and is therefore not discussed in this paper. ANZSIC identifies separate classes for architectural services (7821), surveying services (7822), consultant engineering services (7823), and technical services n.e.c. (7829). 7829, as NAICS 54138, mostly contains technical testing and analysis (ISIC 712) and is therefore not considered as architecture/engineering service in the sense of ISIC.

So, a major difference between the classification systems mentioned above is the treatment of technical testing and analysis. Sometimes it is mentioned together with architecture/engineering, but not in ISIC; hence, this paper will not cover technical testing and analysis. It depends on the national standards and requirements whether a NSO should include this service in figures for architecture/engineering or not.

All classifications, however, differ between construction and engineering activities for construction, which are put in totally different categories. Therefore, construction companies which often provide engineering services for their construction projects on their own are not in the scope. As business registers may have wrong entries, it has to be checked whether the surveyed company is really an architecture/engineering firm.

In some countries (Germany, e.g.), provision of technical personnel like engineers or technicians is seen as an engineering service by the service providers (who often call themselves "engineering society" or similar). This is not in accordance with the classifications; ISIC, e.g., puts architecture and engineering activities (group 711) and temporary employment agency activities (group 782) in different categories.

2.2 Product Classification

Product classifications in use throughout the world also have very comparable structures and details. In general, architectural services and engineering services are separately identified in most product classifications. Consultancy, however, is mostly not identified as a separate sub-sector, if it is mentioned at all. Despite the detail shown by the product classifications, they are rarely used by the countries when developing SPPIs. Most countries develop a special SPPI classification that accounts for the country-specific market structure. For turnover, however, the industry-based ISIC classification and its national derivatives are more common to be used. So, internationally developed product classification systems like CPC seem to be less relevant for service statistics. This should not restrain us from taking a closer look on the product classification systems. The following is a brief presentation of the details used in the CPC, Version 2.0, the Provisional NAPCS work, and the CPA 2008 used in European countries.

CPC 2.0 Product Structure[7]

83 – Other professional, technical and business services

832 – Architectural services, urban and land planning and landscape architectural services

8321 – Architectural services and advisory services
83211 – Architectural advisory services
83212 – Architectural services for residential building projects
83213 - Architectural services for non-residential building projects
83214 - Historical restoration architectural services

8322 – Urban and land planning services
83221 – Urban planning services
83222 – Rural land planning services
83223 - Project site master planning services

8323 – Landscape architectural services and advisory services
83231 – Landscape architectural advisory services
83232 – Landscape architectural services

833 – Engineering Services

8331 – Engineering advisory services
83310 – Engineering advisory services

8332 – Engineering services for specific projects
83321 – Engineering services for building projects

[7] Accessed 7/18/2008 http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=25&Lg=1

83322 – Engineering services for industrial and manufacturing projects
83323 – Engineering services for transportation projects
83324 - Engineering services for power projects
83325 - Engineering services for telecommunications and broadcasting projects
83326 - Engineering services for waste management projects (hazardous and non-hazardous)
83327 - Engineering services for water, sewerage and drainage projects
83329 - Engineering services for other projects

8333 – Project management services for construction projects
83330 – Project management services for construction projects

The North American Product Classification System products identified for real estate are comparable to the CPC products. Aggregates are included for:

54133 Engineering Services
1.1 Engineering services for residential building projects
1.2 Engineering services for commercial, public and institutional building projects
1.3 Engineering services for industrial and manufacturing projects
1.3.1 Engineering services for industrial and manufacturing plant and process projects
1.3.2 Engineering services for industrial and manufacturing product design projects
1.4 Engineering services for transportation projects (transportation = construction of transportation infastructure)
1.5 Engineering services for municipal utility projects (water and waste)
1.6 Engineering services for power projects
1.7 Engineering services for telecommunications and broadcasting system projects
1.8 Engineering services for hazardous and industrial waste systems projects
1.9 Engineering services for projects, nec
1.10 Engineering consulting services
1.10.1 Expert witness services, engineering
1.10.2 Engineering forensic investigation services
1.10.3 Engineering consulting services, other
1.11 Training in engineering services
2 Related products (other important products provided by establishments classified in NAICS 54133)
2.1 Project management services
2.2 Construction project services
2.3 Facility support services
2.4 Architectural services (Same as product 1 on the 54131-2 list)
2.5 Urban planning services (Same as product 3 on the 54131-2 list)
2.6 Building inspection services (Same as product 1 on the 54135 list)
2.7 Surveying and mapping services, except geophysical (Includes products 1-5 on the 54137 list)
2.8 Testing laboratory services (Same as product 1 on the 54138 list)

2.9 Industrial design services (Same as product 1 on the 54142 list)
2.10 Research and development services in engineering (Includes products under 1.2 and 2.2, and selected products under 3 on the 5417 list)
2.11 Custom software application design and development services (Same as product 1.2.1 on the joint list for 5112, 518, and 54151)
2.12 Drafting services (Same as product 1 on the 54134 list)
3 Other related products provided by establishments classified in NAICS 54133
3.1 IT technical support services (Same as product 1.5 on the joint list for 5112, 518, and 54151)

For many of the services listed here, further detailed products have been identified. NAPCS is a very interesting classification as it is a mixture between the product-based and the industry-based approach. It tries to list all products that are offered by a certain industry including those products that are typically offered by other industries, but play a role as secondary activities of the industry described. This can be seen from remarks like "same as product 1 on the 54131-2 list" – the same product appears in different industries. Hence, NAPCS represents a good starting point for identifying all services offered by an industry, regardless of its state as primary or secondary activity.

The CPA used in European Countries also follows the same general breakdowns.

71.1	Architectural and engineering services and related technical consulting services
71.11	Architectural services
71.11.1	Plans and drawings for architectural purposes
71.11.2	Architectural services for buildings
71.11.21	Architectural services for residential building projects
71.11.22	Architectural services for non-residential building projects
71.11.23	Historical restoration architectural services
71.11.24	Architectural advisory services
71.11.3	Urban and land planning services
71.11.31	Urban planning services
71.11.32	Rural land planning services
71.11.33	Project site master planning services
71.11.4	Landscape architectural services and architectural advisory services
71.11.41	Landscape architectural services
71.11.42	Landscape architectural advisory services
71.12	Engineering services and related technical consulting services
71.12.1	Engineering services
71.12.11	Engineering advisory services
71.12.12	Engineering services for building projects
71.12.13	Engineering services for power projects
71.12.14	Engineering services for transportation projects
71.12.15	Engineering services for waste management projects (hazardous and non-hazardous)
71.12.16	Engineering services for water, sewerage and drainage projects

71.12.17 Engineering services for industrial and manufacturing projects
71.12.18 Engineering services for telecommunications and broadcasting projects
71.12.19 Engineering services for other projects
71.12.2 Project management services for construction projects
71.12.3 Geological, geophysical and related prospecting and consulting services
71.12.31 Geological and geophysical consulting services
71.12.32 Geophysical services
71.12.33 Mineral exploration and evaluation services
71.12.34 Surface surveying services
71.12.35 Map-making services

CPA is very close to CPC; however, differences occur:

- 71.12.3, "Geological, geophysical and related prospecting and consulting services" is not included in the architecture/engineering sector in CPC (832/833), but classified as "scientific and other technical services" (834).
- 71.11.1, "Plans and drawings for architectural purposes", is not mentioned in CPA.

All those product classifications are very detailed. When compiling statistical data in such a detailed structure, it has to be secured that the sample size is large enough to get confident numbers. Especially for SPPIs, the countries tend to publish only few, but robust sub-indices.

Practices in the field of architectural and engineering services vary across countries. However, to the extent possible given by market conditions, it is recommended that product classifications be developed that will map to the generally accepted breakdowns included above. This will increase international comparability but also separate products and product groups based on different measurement variables and practices.

3.0 Turnover Statistics – Recommended Development Options

As noted in the introduction, the Voorburg Group has not previously addressed turnover practices for architectural and engineering activities. The recommended development options presented here are based on a survey of 15 countries producing turnover statistics in advance of the 2008 Voorburg Group meeting in Aguascalientes, Mexico.

The fee for architectural and engineering services – forming the revenue and adding up to the turnover to be measured – can be of different nature, in form of fixed fees, hourly fees, and percentage fees. They can be just measured straight forward. Additional expenses have to be included in the turnover figure as well.

Architecture and engineering companies often offer services belonging to other service sectors. This may include provision of personnel or facility management. When turnover collection is based on products, it is recommended to survey the companies for all activities they do, so a real product-based turnover data can be achieved. It is not a challenge for an industry-based approach, where the main activity counts. However, most

countries offer turnover data for sub-sectors as well. Especially when publishing very detailed data, it is a must to check that the assignment of the respondents to the sector is correct. All NSOs that use surveys or census for measuring turnover do this by questioning the activity of the responding companies. It is a harder task for checking administrative data. For that purpose, the NSOs may apply the following methods:

- Combining information from different administrative data sources: companies are listed in different registers like the business register, tax register, social security files and so on. Most of them have an indicator for the sector which the company belongs to. By combining the information, it is more likely to identify misclassified companies.
- Data in the registers is improved by personal visits of the companies and surveys for re-classification. Those surveys are done when the classification system changes.
- Combination of sample and administrative data: While information about all companies is derived from registers, some of them are sampled in a representative way and checked for their activities and other data. The administrative data can then be adjusted by the figures from the sample survey.[8]

A big problem with the use of administrative data is that it has not been designed to obtain statistical economic indicators. E.g., data from the tax authorities in Germany has the following weaknesses:[9]

- Definition of "turnover" is different: e.g., the tax authority includes sales of assets which are not included in what turnover statistics want to measure.
- Large corporate groups with many small subsidiaries are treated as one company by the tax authority; hence, turnover gained by sales between those subsidiaries is not counted - a mistake in terms of turnover as an economic indicator.
- Turnover for which no tax is paid is quoted, but often in doubtful quality.

When using only administrative data, NSOs must be aware of weaknesses like that and find fitting remedies.

For developing turnover statistics, the NSOs may follow the approaches listed in the table below. Which option is chosen, largely depends on the purpose of the statistics (e.g., economic indicator or input of National Accounts), on the resources and political conditions.

[8] Currently, Germany is planning to apply this approach for the 2011 population census.
[9] see Kaumanns/Schelhase (2007), p. 769ff.

Table 1: Options for Developing Turnover Statistics – Architectural and engineering activities[10]

Category	Data Source	Level of Detail Collected	Frequency	Cost	Comments
Best	Survey/Census	Industry turnover and product turnover detail;	Sub-annual collection (monthly or quarterly)	- Most expensive - Largest response burden	- Allows greatest flexibility to identify specific revenue streams, residential and non-residential allocations can be collected directly. - Timely data
Good	Survey/Census	Industry detail only	Sub-annual	- Expensive - High response burden	- Industry detail may not be sufficient to delineate sources of revenue or important residential/non-residential components using ISIC. - Timely data
Good	Combination of census (large companies) and administrative data	Industry detail only	Sub-annual	- Less expensive - low response burden	- Industry detail may not be sufficient. - Timeliness questioned - Different definitions for turnover in administrative data files may cause (justifiable) bias
Minimum	Administrative (tax data, industry association data etc.,)	Industry detail only	Annual	- Least expensive - Little or no respondent burden	- Income and production definitions can differ adding imprecision to estimates using tax data in place of actual revenue received for services - Least timely

[10] The table is based on Murphy (2008); turnover statistics seem to be quite similar for most of the service sectors.

3.1 Other Considerations

The surveyed NSOs identified the following major challenges for developing turnover statistics:

- misclassification of companies: often, companies in the business registers have wrong activity codes. This leads to biases in the results of the statistics.
- Sub-contracting/off-shoring: Sub-contracting means double-counting of turnover. However, this is in line with the turnover definition. A related problem when using value-added tax data are corporate groups and their internal sales not listed in the tax data but required for turnover data.
- Low accuracy of data due to ill-defined classification. This should be overcome by the introduction of a new ServCom classification.
- Change from CPA 2002 to CPA 2008.
- Poor data quality in registers. Strategies to cope with this are mentioned above.
- Assuring the continuity of long-time series which is threatened by classification and methodology changes.

Turnover data collections also provide the opportunity to collect additional information that is not product related. It is fairly common to collect employment levels, payroll data, and other variables as part of turnover surveys. This can help to improve other surveys and registers as well.

Communication between national accountants and turnover statisticians about the methods being used in national accounts will help ensure that efforts are in line and the resulting statistics will be as applicable as possible. However, national accounts is not the only user of turnover data so it is important to ensure that other needs are met as they are identified as important.

4.0 SPPI Recommended Development Options

Rather than present a tabular set of recommendations for the development of service price indices, a review of the common practices and recommended methods of addressing those practices will provide a more thorough set of development options. Because of variations in the practices within industries and even within firms, the actual practices and availability of data will determine the most appropriate method(s) of estimating price change.

Before clarifying what is asked, a word should be spoken about who is asked. The main sources of addresses are official business registers, often combined with sector information, e.g. address lists kept by the chambers for architects and engineers. The method of determining the respondents differs from country to country. The most popular approach seems to be – in line with the recommendations of the SPPI methodological guide[11] – PPS-sampling (Probability Proportional to Size). It is often combined with a cut-off limit – only companies above a certain minimum limit are considered – and a total stratum, i.e. all companies exceeding a certain level are included in the sample. The

[11] OECD/Eurostat (2005), p. 23.

criterion, on which PPS sampling is based, however, is not common sense: some national statistical offices (NSOs) use turnover, others number of employees.

A word should be said about governmental regulations in these sectors. In basically all countries, laws exist that assure minimum standards for architectural and engineering designs, e.g. concerning product or building safety. Some services are even imposed by those regulations, like safety and health coordination on construction sites in the European Union.[12] In some countries, price setting is actively regulated by government rules – like in Germany, where – for certain architectural and engineering activities – an official scale of fees has to applied mandatorily, or in France, where public contracts are under regulation. Hence, it is always worth taking a look at the laws when setting up an SPPI for these services.

As said in the chapter about classification, all countries use different classification systems to fit to their individual market situation; however, the major distinction between architectural and engineering services remains in every country surveyed, so SPPI development for both sub-sectors is investigated separately.[13]

Architectural services

Before 2007, architectural services have been addressed by two papers of the Voorburg Group: Israel (2006)[14] and Norway (2000)[15], which provide – besides explaining the national approach – very good insights into the characteristics of architectural services. Combined with the results of the survey conducted before the preparation of this paper among the members of the Voorburg Group, the characteristics of architectural services can be summarized:

- A main aspect of architectural services is their uniqueness: they are performed only once. Repeated services are hardly observed; the objects to be planned are unique.
- Architects categorize their customers into three main groups: private households, private enterprises and public institutions.[16] They all tend to have different pricing mechanisms and service requirements.
- Sometimes, architectural services can be further broken down by activity; an example from Germany:
    - Architectural services for structural engineering and interior design
    - Urban regional and country planning architectural activities
    - Landscape architectural activities

    …are put into separate pricing categories in Germany.

[12] Regulation No. 92/57/EEC, article 3 no. 1: "The client or the project supervisor shall appoint one or more coordinators for safety and health matters…"
[13] It has to be remarked, however, that both services can be supplied by just one enterprise; especially engineers often offer architectural services as well, see Rosenbaum(2002), p. 6; Hommerich/Ebers (2005), p. 39.
[14] Assaf (2006).
[15] Krüger (2000).
[16] Assaf (2006), in addition, differs between commercial buildings and industrial manufacturing facilities.

- Architectural services are conducted by rather small companies with few employees. Company sizes tend to be smaller than for engineering companies. Often, architects disregard record keeping and have therefore problems by calculating charge-out rates.

Architects often offer a huge variety of services. In order to ease the compilation of an SPPI, the statistical offices tend to focus on the collection of prices for a core business of the architects. So, prices may only be collected for structural engineering and just for one type of customer. It is assumed that the prices for the chosen services correlate with those of the other services or, at least, the chosen service represents the major output of architects and is therefore most important to be tackled by price statistics.

Regarding pricing methods, two approaches are dominant: Pricing based on working time and model pricing. Pricing based on working time tracks hourly charge-out rates that are usually distinguished by position of staff, type of service and sometimes by type of customer, too. To avoid the productivity bias,[17] many statistical offices use model pricing – or, at least, try to: one of the major challenges in developing SPPIs for architecture and engineering was identified as the resistance and disability of companies to price models set up by the statistical offices. Some offices even switched to pricing based on working time because model pricing resulted in very poor response rates. So, which one of these preferred pricing methods is chosen depends on the national market circumstances.

However, in some cases, other pricing methods may be applied as well. There are examples of percentage fee (Germany, due to governmental pricing regulation; France, Spain), contract pricing (Hungary) and component pricing based on repeated services for one client (USA).

In Krüger (2000), an investigation is described about the determining factors of the prices for architectural services. While the regression models showed a bigger correlation between the height of the price and the m² of the project, price indices based on m² proved to be far more volatile than expected. Therefore, Norway changed to hourly charge-out rates which had less explanatory power, but performed better in the sense of an SPPI.[18]

Engineering Services

Engineering Services have been addressed by a very extensive Voorburg Group paper in 2002 contributed by the USA[19], which includes descriptions of the methodologies of Australia, Canada, France, the Netherlands, New Zealand and Sweden as appendices.

When categorizing engineering services, one distinction is always made: between construction related and non-construction related services. Where construction-related

[17] When hourly rates remain constant, but the service is performed quicker because of higher productivity, the price for the service will decrease, but the SPPI will show price stability. For productivity bias see also OECD/Eurostat (2006), p. 42.
[18] Krüger (2000), p. 2ff.
[19] Rosenbaum (2002).

services dominate, further distinctions are made: Building and non-building related services, type of customer (private households, private enterprises, public institutions) and further break-downs. Non-construction related services, on the other hand, are very often not covered at all; they seem to be harder to tackle, because their appearance varies greatly. Very often, a classification for engineering services that matches the market conditions seems to be almost impossible, despite official classification systems like CPC! At least, a definition of the nature of engineering services can be provided: "Engineering services are defined as engineering consulting work specified by an hourly volume, activity area and category of personnel. These types of services occur in different areas."[20] In better detail: "The assignments undertaken by these [engineering] establishments may involve any of the following activities: provision of advice, preparation of feasibility studies, preparation of preliminary and final plans and designs, provision of technical services during the construction or installation phase, inspection and evaluation of engineering projects, and related services."[21] Combined with dozens of industrial sectors for which engineering services can be provided, this is the explanation for the problems with classifying these services. And the task is not simplified by terms like "financial engineering" or "software engineering". So, defining the horizontal range of "engineering services" is difficult.

The same applies for the vertical range. Because engineering services are unique, industrial firms tend to hire engineers just for conducting certain projects; and as the possibilities for cancellations and limited working contracts are restricted, especially in European countries, some engineering companies have expanded into the field of providing those firms with engineers and technical personnel – something that is better known as "provision of personnel". Where this is a usual business habit, it has to be considered by the Statistical Office whether to include such a service in the SPPI or not. This clearly depends on the national market structure and the national perception of "engineering services".

Pricing for engineering services can be done in different ways. The calculation of the price by the company, however, in most cases is aligned with the following mechanism:[22] One time a year, companies calculate standard hourly rates based on the costs. . These rates are standard prices (list prices) which are the underlying basis of every offer. When the company bids for a project, it estimates how many hours of which grade of workers will be needed. By multiplying the hours with the standard rates, a standard price is achieved. The final price that is charged, however, is subject to negotiation and the circumstances of the offer.

Based on this mechanism, the form of the charged prices is normally fixed fees. For projects where the size of the project is hard to predict or rather small projects, hourly rates are common. Normally, prices for fixed fee-contracts are higher than hourly rates contracts, because the engineering company takes the risk of underestimating time and

[20] Sweden, in: Rosenbaum (2002), p. 53.
[21] NAICS 1997, in: Rosenbaum(2002), p. 4.
[22] Described for the Netherlands by Aurel Kennessey, in: Rosenbaum (2002), p. 39.

effort of the project. These are the most common price mechanisms. Depending on the country, some "exotic" pricing mechanisms also exist, namely:

- Percentage fees: the fee of the engineering company is a percentage of the total costs of the project.
- Price dependent on the success of the project: "…The price can sometimes vary with the extent to which the finished product's performance turns out to exceed the specified minimum requirements."[23]
- Sometimes, engineering companies are just captive units of larger industrial companies and do not provide services to the economy outside. For these companies, prices are rather costs and should not be monitored as they do not reflect the market.
- Price regulated by the government: This happens in some countries, especially for the construction-related engineering services and surveying services.

Based on the described pricing mechanisms, which pricing method should be chosen? This depends on the situation in the country investigated. In most cases, the national statistical offices choose model pricing or the time based method, represented by hourly charge-out rates (sometimes daily charge-out rates).

- Model pricing seems to be a perfect fit for unique engineering services at first: When the model is well-defined including labour categories, rates, and quantities, "…reporters will be able to use this information to precisely estimate what the service would cost in subsequent periods."[24] Furthermore, no quality adjustment is necessary. However, model pricing has disadvantages:[25] models get quickly outdated; estimating the final price after negotiations "…makes the survey very subjective, turning the survey into one of market sentiments." A Dutch experience was that, when different project leaders estimate the price, "…quite different prices result since every project leader perceives a project differently. Consequently, many respondents consider repricing an old project too subjective." Another weakness is that model pricing can only be applied to smaller projects, because the effort of estimating large projects is too high. As our survey and the 2002 paper show, many attempts to establish model pricing based SPPIs failed: Reasons were: unwillingness to estimate models by the companies; standard models for every company, producing totally hypothetical prices; for models based on real one-time transactions, no updating of hours worked and margins, only of hourly rates;[26] low response rate; model pricing often seen as too difficult by the respondents. Another disadvantage of model pricing is the large sample size, which is needed due to the high response burden; therefore only few price quotations can be obtained from a company. Today, 7 out of 14 NSOs that answered our survey use the model pricing approach; only three of them as the principal method, the others for certain activities only or as alternative method.
- The method that turned out to be the standard method for engineering service – as far as possible – is pricing based on working time, usually in the form of hourly charge-

[23] Sweden, in: Rosenbaum (2002), p. 52.
[24] Rosenbaum (2002), p. 11.
[25] Harshly criticized by Kennessey, in: Rosenbaum (2002), p. 41.
[26] „…price variation related to changes in the way services are provided and in the way fees are estimated, as well as to changing economic conditions would not be reflected…"; Canada, in: Rosenbaum (2002), p. 27.

out rates by personnel category and activity. Despite the problems with productivity bias and quality adjustment, 11 out of 14 NSOs use this method, 9 of them as preferred method. It seems to be the easiest way to get valid price quotations from the respondents. The data type in the survey, however, is often subject to the respondents and their abilities for data delivery: Realised charge-out rates (data type: real transaction prices) can be observed as well as list prices or pure input prices (labour costs). It is recommended to use realised charge-out rates where possible.

Other pricing methods are used as well, normally for smaller parts of the market with special conditions. E.g., surveying services are often treated separately from other engineering services. Prices of repeating services and contract pricing are regularly used pricing methods for surveying services in several countries.

It is worth noting that, in 2002, the Netherlands and Canada presented innovative approaches for the collection of prices for engineering services:[27]

- The Dutch method may be referred to as *realised contract pricing.*[28] It needs the quotation of list prices (standard hourly rates) every year; for a certain quarter, the respondents quote several completed contracts with their worked hours by qualification and the total price which is billed to the customer. Then, the realisation rate is calculated by dividing the billed price by the standard price (calculated of the standard hourly rates and the worked hours for the completed contract). The basis for the construction of the price index are the standard hourly rates (surveyed every year) which are updated by the realisation rate every quarter. The approach seems to overcome the problems with model pricing. But it is worth questioning whether it may yield better results in terms of productivity bias then pricing based on working time does. And it has not yet proven its feasibility: Today, the Netherlands use pure pricing based on working time and intend to switch to model pricing soon.
- The Canadian approach is called *estimated output pricing*[29]. It is based on the assumption that the price can be calculated by multiplying hourly rates, number of hours worked, and a multiplier representing the changes in the market situation, overhead costs and profit margins – it is called the "realised net multiplier". To reflect this price mechanism, StatCan creates a composite price index with the following formula:

  $$P = \textit{wage rate index} \cdot \textit{hours of labour index} \cdot \textit{realised net multiplier index}$$

  The wage rate index reflects the average of the annual percentage changes in salaries or wage rates; the realised net multiplier index is represented by the labour productivity (division of value added and salaries/benefits).[30] StatCan still produces its SPPI for engineering services in this manner, but only on an annual frequency.

[27] Netherlands: Rosenbaum (2002), p. 40; Canada: Rosenbaum (2002), p. 27ff.
[28] Until now, there has been no term for this method in the thesaurus; the Dutch description in Rosenbaum (2002) gives no name to the "baby" either.
[29] This was the indication in Canada, Rosenbaum (2002), p. 27; in the survey carried out as input to this paper, StatCan called the method "Proxy Estimation Method".
[30] For exact definitions see Canada, Rosenbaum (2002), p. 27f.

4.1 Other Considerations

Especially, as pricing based on working time is the preferred pricing method, there have been a lot of attempts to measure productivity development and to facilitate quality adjustments. Many NSOs see quality adjustment as a major challenge; however, there have been no reports about a satisfactory procedure for that task until now. Attempts to measure productivity increases by CSO Netherlands in 2002 showed "discouraging" results.[31] However, as long as productivity and quality proceed at a relatively low pace, an SPPI based on hourly rates will serve as proxy good enough to serve our customers' needs.

Architecture and engineering activities can be broken down to a large variety of services. As SPPIs for them are complex and costly undertakings, national accountants, industry associations and other customers should be consulted if only partial coverage is going to be obtained. Keeping contact with the industry throughout the ongoing survey is necessary to get information about trends which may affect the SPPI and to secure a high response rate. Communication is one of the key to an SPPI of high quality: many NSOs see it as a major challenge to convince the respondents of the necessity of an SPPI and to get the right price quotations. Visits "at home" are certainly a good measure to obtain good results.

As the industries evolve, new types of services are created for which new statistical treatments have to be considered. In the field of engineering services, these are so-called "design-build contracts". They are bundled packages of services that include architectural, engineering, and construction services in a single contract. When engineering and architectural companies get these contracts, they often subcontract the construction activity. In classification matters, design-build contracts are rather a part of the construction sectors, because the construction part accounts for the major part of the value added. So, design-build contracts are not included in the SPPI for engineering and architectural activities; engineering companies focusing on these contracts should be reclassified to the construction sector.

[31] Netherlands, Rosenbaum (2002), p. 40.

5.0 Summary and Further Suggestions

The sector of architecture and engineering activities is characterized by a huge variety of different service offered in many sub-sectors. Especially engineering services are input to almost all industrial and construction sectors. This variety creates challenges to both turnover and price programs.

Regarding classification, all classifications have similar breakdowns on higher aggregation levels, but show variations regarding the detailed breakdowns. Especially the treatment of technical testing and analysis, normally not belonging to ISIC 711, but ISIC 712, is different. The experience also shows that classifications used for SPPIs often do not account for the official classifications, but for customized versions that fit to the perception of the market. While uniform treatment on high level aggregated is recommended to assure international comparability, detailed breakdowns are more a question of national requirements and should be designed by the NSOs to provide information as useful as possible to the customers.

A major challenge for collecting turnover data are outdated business registers. Combination with other administrative data helps to improve and validate the data. On a product level, it is also recommended to ask for services that are not classified as architectural or engineering activities but form an important part of the industry's turnover.

As markets for architectural and engineering services show national differences and characteristics, no best practice recommendation can be given for the development of SPPIs for these services. In some cases, model pricing approaches are appropriate. In other cases, hourly charge out rates might be the best choice. But their may be totally different approaches with percentage fees or even composite approaches multiplying several sub-indices, as the Canadian example shows.[32] So, for each market, it must be checked which method is the best to suit national market characteristics.

When developing turnover and pricing statistics, it is necessary to keep in mind that there are many customers for these kinds of statistics. NSOs are demanded to care about the often different needs for data of National Accounts, central banks, private enterprises and scientists. Hence, they should try to design statistics, that suit the needs as best as possible; sometimes, a solution can be found by calculating different indices from the same data input custom-tailored to the specific needs.

[32] Canada, Rosenbaum (2002), p. 27ff.

APPENDIX

A.0 Overview of International Progress

In advance of the 23rd Voorburg Group meeting in Aguascalientes, Mexico, countries were asked to provide a progress report for a selected group of industries. As of August 13 2008 usable results were received from 20 countries. The survey asks for progress on collecting turnover data for industries and products, price data for industries and product classes, and the alignment of their turnover and price data. Table 2 is a summary of the information received to date.

Table 2: Results of progress report inquiry for ISIC (4) 7110.

ISIC 7110	a. PPI details >= CPC	5
	b. PPI details >= CPC soon	1
	c. Turnover details >= CPC	8
	d. Turnover details >= CPC soon	1
	e. Industry prices calculated	15
	f. Industry turnover collected	15
	1. Detailed turnover and prices well aligned	4
	2. Detailed turnover and prices well aligned soon	1
	3. Industry level turnover and prices aligned	4
	4. Industry level turnover and prices aligned soon	6
	5. Other - no industry coverage for prices and/or turnover, etc.	5

Architectural and engineering activities is a sector with an already good coverage of price and turnover data. 15 out of 20 countries calculate SPPIs on an industry level; also 15 out of 20 collect turnover data. Turnover statistics seem to be more advanced than pricing statistics. While 8 countries collect turnover data on a basis equally or more detailed than CPC, only 5 countries achieve that level of detail.

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