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# INTERNATIONAL RECOMMENDATIONS FOR INDUSTRIAL STATISTICS 2008

Prepared by the United Nations Statistics Division

# INTERNATIONAL RECOMMENDATIONS FOR INDUSTRIAL STATISTICS 2008

## Draft

**This document has not been officially edited**

# FOREWORD

With a view to establish a uniform pattern for the measurement of economic activities on a comparable basis, international recommendations have been formulated by the United Nations for collection of statistics on a number of economic activities. International recommendations for industrial statistics were first formulated in 1953 and revised from time to time, last being in 1983.

The United Nations Statistical Commission at its thirty-seventh session in 2006[1] endorsed the proposal for revision of the international recommendations for industrial statistics (IRIS). The provisional draft of the IRIS was prepared following the conclusions of the first meeting of the Expert Group on Industrial Statistics held on 19-23 September 2005. The draft has been reviewed and endorsed by the Expert Group at its second meeting during 16-19 July 2007.

This publication is part of UNSD initiative for strengthening countries methodological and operational foundation of industrial statistics built through the World industrial programme on industrial statistics in particular and development of economic statistics in an integrated manner in general. This may also be seen as useful step in developing as integrated approach to economic statistics by national statistical systems. Though this publication makes recommendations for industrial statistics but some common elements of the recommendations like definition and delineation of statistical units, data collection strategy and data compilation etc. could equally be used as a tool for developing as integrated economic statistics system for business statistics in general with a view to compiling, in the most cost efficient way, basic economic data across sectors, consistent with macroeconomic statistics.

The publication is designed to provide the comprehensive methodological framework for collection and compilation of industrial statistics in all countries irrespective of level of development of their statistical system. It is intended primarily for the producers of industrial statistics particularly the staff of national statistical offices involved in the collection and compilation of industrial statistics. It may be useful to the researchers and other users of industrial statistics.

[1] Official Records of the Economic and Social Council 2006, Supplement No. 4 (E/2006/24) Chapter I C 3(c) page 7.

## CONTENTS

## PART II GUIDANCE FOR IMPLEMENTATION

# INTRODUCTION

## *Background*

1. Since the 1950s, the United Nations (UN) has published international recommendations for industrial statistics of which the first was issued in 1953 (UN 1953) and subsequently revised in 1960 (UN 1960), 1968 (UN 1968a) and 1983 (UN 1983). The purpose of developing these international recommendations was to establish a coherent and uniform measurement of industrial activities for national and international dissemination.

2. The UN Statistical Commission at its thirty-seventh session in 2006 reviewed the industrial statistics programme and endorsed the proposal of the UN for the revision of the international recommendations for industrial statistics as there has been significant economic and statistical developments since these were formulated last (UNSC 2006).

## *Purpose of the international recommendations*

3. The international recommendation for industrial statistics is an agreed intermediate output framework of a coherent set of internationally agreed principles, concepts and definitions of data items to be collected and published for the measurement of the industrial activity. The National Statistical Offices need to assess applicability and practicability of implementing the recommendations to their situation taking into account their circumstances, for example, identified user needs, resources, priorities and respondent burden.

## *Need for the revision of the international recommendations*

4. The present publication revises the 1983 recommendations (UN 1983) in respect of developments in this area during the last 25 years. This revision reflects a comprehensive measure both in the approach adopted by the majority of countries to adapt the industrial statistics program to the needs of national accounts and the measurement of the industrial sector for the economy as a whole. Apart from the adopted comprehensive measure of the industrial sector aligned with the national accounts needs, this revision incorporates the harmonisation with the revisions of various international statistical standards and regional regulations. The more important factors that have guided this revision are the following:

(a) Revision of 1993 SNA that warranted changes relevant for the industrial statistics include: (a) treatment of goods sent abroad for processing; (b) additional elements for the measure of compensation of employees like ‘employees stock options’; (c) recognition of units providing ancillary services as a separate establishment in some specific circumstances; (d) classification and terminology of assets; (e) capitalisation of database

development and (f) capitalisation of research and development expenditures, etc;

(b) Consistency with changes in concepts, definitions and terminology in other major statistical publications and regulations of other international organisations such as Statistical Office of the European Communities (Eurostat 1996) regarding the Council regulation on structural business statistics; Organisation for Economic Co-operation and Development (OECD 2002, 2007) in respect of measurement of non-observed economy and data and metadata reporting and presentation; International Labour Organisation (ILO 1993) with regard to International Classification of Status in Employment and the International Monetary Fund (IMF 2007) in respect of treatment of multi-territory enterprises.

(c) Revision of International Standard Industrial Classification of All Economic Activities Revision 4 (ISIC Rev. 4) (UN 2006) and Central Product Classification (CPC) Ver. 2 (UN 2007a);

(d) Inclusion of aspects of globalisation of the industrial production process and use of electronic commerce, etc;

(e) Efforts of countries to minimise the differences between the concept of "census value added" by approximating the measurement of national accounts value added by including additional data items in their inquiries;

(f) Experience of countries in both developing an industrial statistics system and conducting an integrated system of annual and infra-annual industrial inquiries adapted to the needs of national accounts and the measurement of the industrial sector for the economy as a whole

(g) Change in valuation of industrial output to basic prices in accordance with valuation principle recommended by the 1993 SNA and applied in business accounting;

(h) Expansion of the link between the economy and the environment by extending the coverage of the data items to include the use of natural resources like energy, water, mineral, generation of solid waste and waste water and by-products.

***Scope and relevance of the international recommendations***

5. In terms of International Standard Industrial Classification of All Economic Activities (ISIC) Rev. 4, the scope of the industrial sector is defined to cover mining and quarrying (section B) manufacturing (section C), electricity, gas, steam and air conditioning supply (section D); and water supply; sewerage, waste management and remediation activities (Section E). The scope of the economic activities has been

broadened as compared to the international recommendations of 1983 because the activities of sewerage, waste collection and remediation have been added in line with the broadening of the scope of Section E in the ISIC Rev. 4.

6. The policy relevance and multiple use of a coherent set of internationally comparable industrial statistics pertain to two distinct but interrelated set of annual statistics and short-term industrial statistics. Moreover, these industrial statistics form part of a broader domain of structural and short-term business statistics covering other economic activities like construction (UN 1968b, 1997), distributive trade and services (UN 1958, 1975) for which separate international recommendations have been prepared. In addition, international standards have also been established for measurement of specific activities like tourism (UN 1994, 2001).

7. More specifically, the structural business statistics are production-related statistics that are collected and compiled to establish the structure, activity, competitiveness and performance of enterprises at national, regional and international level. By contrast, the short-term business statistics are infra-annual[1] production-related statistics that are collected to monitor business cycle with respect to the short-term evaluation of supply, demand and production factors.

8. These international recommendations on industrial statistics together with similar international recommendations on other economic activities articulate a common integrated framework encompassing both the structural and short-term business statistics for goods and services producing industries with the 1993 System of National Accounts as the overarching macroeconomic framework. These intermediate output frameworks of business statistics will be based on common methodological principles and common definitions of data items that will allow for a coordinated compilation of harmonized statistics with reliability and flexibility to the level of detail required to meet the needs of governments, business community and regional and international agencies.

9. Structural business statistics generally provide annual information referring to a whole reference year. They show changes from one year to the next, and can be used to judge the accuracy of infra-annual data, mainly on quarterly and monthly basis which is often produced from samples of smaller size. The production figures from structural business surveys, when administered, should be used to generate product data or be complemented by specialized commodity production surveys. Whatever the data collection instruments might be, detailed production data in value and volume is to be internationally reported for an agreed set of industrial commodities[2] for purposes of international comparison. Finally they can provide a benchmark statistics for analyzing infrequent, irregular or one-off surveys.

10. Short-term business statistics are often used to produce monthly or quarterly indicators, and often take the form of indices. They are produced to a strict timetable which users expect to be met. Sometimes this means that initial figures are subsequently

[1] The term "infra-annual" replaces the term "more-frequent-than-annual" used in UN (1983).
[2] UN List of Industrial Products, available from http://unstats.un.org/unsd/industry/commoditylist2.asp?s=0

revised as more data is collected and analyzed. The collection and compilation of the monthly and quarterly index of industrial production from the infra-annual enquiries are dealt with in a separate publication[3] although the internationally agreed list of data items is included in this publication.

***System of inquiries of the international recommendations***

11. The framework is confined to a system of regular annual and infra-annual general-purpose inquiries covering production-related activities. It is primarily concerned with statistics appropriate to the establishment or establishment-type unit. Enterprise statistics are discussed only to the extent that they supplement data items collected from the establishment by making it possible to obtain a closer approximation of the measurement of national accounts value added of enterprises engaged in industrial activities in order to meet national accounting needs. International recommendations for enterprise statistics have not yet been formulated, and it is not the intention to establish guidelines in this area in this publication.

12. This revision of the existing industrial statistics recommendations fully articulates the relationship with the System of National Accounts (SNA) based on the progression of countries in adapting the industrial statistics programmes to the needs of national accounts. With this progression, the present publication deviates from the previous industrial recommendations by discontinuing the recommendation of the measurement of "census value added" as a net output measure of industrial activities. Only when countries would like to maintain their time series on "census value added", countries could opt for continuing its measurement. In contrast, this revised international standard recommends the collection of data items through annual and infra-annual enquiries by all countries to approximate the national accounts measurement of value added and thereby approximating the contribution of industry to the gross domestic product for the economy as a whole. It is noted that an exhaustive rather than an approximate measure of national accounts value added through an annual inquiry is seldom possible and even appropriate with the data items for industrial statistics recommended in this publication. Only at the stage of national accounts compilation, macro adjustments are made like for insurance and financial intermediation services as they are indirectly measured in national accounts and not through direct observation.

13. Extending the measurement of the industrial activity for the economy as a whole also has the implication that the annual and infra-annual inquiries should cover all establishments that were engaged, at any time during the inquiry period (that is reference period to which the data relate) in the production of goods and services for sale or exchange[4].

[3] Index Numbers of Industrial Production. Studies in methods series F No.1, 1950 (under revision) forthcoming in 2008.

[4] Production of goods by households for own-consumption, which is in the SNA production boundary, is not the subject of the industrial inquiry and should be covered through other means like time-use surveys or the household income and expenditure surveys.

14. If the coverage of establishments is to conform to SNA requirements, the annual and infra-annual inquiries should include all micro and small scale industrial activities whether household based, taking place at locations outside the households or without a fixed location. In countries where the micro and small scale units are numerous and contribute significantly to industrial output, efforts should be made to include these activities through mixed household-enterprise or establishment surveys through regular annual and infra-annual inquiries rather than infrequent inquiries.

***Data items of the international recommendations***

15. The infrequent enquiry usually conducted in a 5 to 10 year cycle in the developing countries is often used as a tool for creating area frame of establishments and enterprises besides providing benchmark estimates of general-purpose production statistics. Such estimate are less accurate as compared to the one based on regular annual and infra-annual enquiries. For those countries in the process of developing their industrial statistics, it is recommended that priority should be given to developing an integrated system of annual and infra-annual inquiries..

16. The data items and their definitions recommended in the previous recommendation have basically been maintained in the present publication. However, data items have been added and definitions revised to reflect the update of the 1993 System of National Accounts. Moreover, the link to the environment and environmental accounting has been extended by broadening the annual collection of intermediate consumption of quantities and costs of important fuel types in the 1983 recommendations to (a) important minerals, (b) water extraction for own use, and (c) quantities of solid waste and waste water generated and the costs of their collection and disposal.

17. Most countries have by now accumulated substantial experience in building an industrial statistics programme based on an integrated set of annual and infra-annual inquiries. The present set of recommended data items to be collected through annual and infra-annual collections has not been ranked by assigning priorities of importance based on the various stages of implementation of the recommendations. Rather the approach in the present recommendations is to adopt a universal list of data items, statistics on which are to be collected and published and that is fully harmonised with the needs of national accounts and a measurement of industrial sector for the economy as a whole. The present recommended list of data items is expected to be applicable universally to all countries with no distinction between the developed and developing countries and therefore, countries are encouraged to adopt them.

18. The recommendations are not intended to be prescriptive but countries are encouraged to implement them. The countries may choose a particular method for implementation of the recommendations depending upon their own needs and capabilities like needs of data users and availability of data through statistical and administrative sources. It is recognised that industrial statistics system has to balance the need for the

detailed data on one hand and the cost and response burden of collecting the data on the other.

***Users of the international recommendations***

19. Data on industrial activities are required by variety of users including the government, business community, researchers and others for a variety of purposes. One of the most important is, undoubtedly, to provide a basis for assessing trends in the economy. For this purpose annual and infra-annual estimates on the contribution of industrial activities to the national economy are highly demanded by:

(a) *Policy makers* who use industrial statistics for formulation of industrial development strategies and plans at the national and regional levels as industrial development is important for every economy and it provides necessary impetus for the growth of the service activities.

(b) *Business community* which uses industrial statistics for evaluating business options, assessing opportunities for new investments and estimating market shares for their products,

(c) *Researchers* who study the technology employed in the production process in terms of input-output relationships and productivity analysis by detailed economic activity, by size classes of operation, by geographical characteristics for regional, national and international analysis and by ownership structure,

(d) *Compilers of national accounts* who make extensive use of industrial statistics including for (i) measuring the annual and quarterly output and valued added generated by industrial activities; (ii) compilation of supply and use tables by product and by industry and input-output tables.

(e) *General public* who benefit from the availability of timely industrial statistics to evaluate conditions of the economy, employment and income perspectives in order to make more informed decisions.

***Organisation of the publication***

20. The present publication on international recommendations for industrial statistics comprises two parts and covers all aspects of industrial statistics. Part-I includes international recommendations on industrial statistics covering the scope of industrial statistics, statistical units, characteristics of statistical units, data items and their definitions, and the data items for international reporting. In addition, Part-II includes the international guidance to help implement the international recommendations and covers performance indicators, data sources, compilation methods and data collection strategy, data quality and dissemination of industrial statistics. It comprises the following nine chapters and two annexes:

*Part – I International recommendations*

(i) Chapter I provides the description of the industrial activities in terms of International Standard Industrial Classification of All Economic Activities (ISIC) Rev.4 and other classifications, discusses boundary issues and defines the scope of industrial statistics;

(ii) Chapter II describes the statistical units that are useful for collection of industrial statistics and economic analysis of the economy;

(iii) Chapter III explains the main characteristics of statistical units required for their unique identification and classification;

(iv) Chapter IV presents the definitions of data items for a general-purpose information system on industrial statistics with reference to the data items to be collected and statistics to be published. It also presents the data items for international reporting with annual and infra-annual periodicities;

*Part – II Guidance for implementation*

(v) Chapter V describes a set of main indicators useful for evaluating the performance of the industrial sector;

(vi) Chapter VI discusses the main data sources and methods used for compilation of industrial statistics;

(vii) Chapter VII outlines a strategy for collection of data relating to industrial activities through annual and infra-annual industrial inquiries;

(viii) Chapter VIII discusses data quality and metadata relating to industrial statistics;

(ix) Chapter IX provides guidance and good practices on the dissemination of industrial statistics.

(x) Annex 1: Economic activities in terms of ISIC Rev 4 within the scope of industrial statistics; and

(xi) Annex 2: Identifying the principal activity of a statistical unit using the top-down method.

# PART I

# INTERNATIONAL RECOMMENDATIONS

# I. SCOPE OF INDUSTRIAL STATISTICS

## A. Economic activity

1.1 In general the term "economic activity" is understood as a process, that is to say, as the combination of actions carried out by a certain entity that uses labour, capital, goods and services to produce specific goods or services. An activity is characterized by (i) an input of resources; (ii) a production process; and (iii) an output of products. By convention, one single activity is understood as a process resulting in a homogeneous type of products. It is recognized that one activity may consist of one simple process or may cover a whole range of sub-processes, each of which might be classified in different activity categories. For statistical purposes an entity engaged in a given activity may be treated as a simple or complex. A simple entity is not subdivided into parts to which activities are attributed while a complex entity is, by definition, composed of several sub-entities each of which is seen as performing a specific activity. An entity engaged in more than one economic activity may produce more than one product. Such an entity may be subdivided into parts each performing separate activities producing separate products if either book-keeping records allows or some statistical methods developed for the purpose of separation; each part of the entity in this case may also serve as a statistical unit.

## B. Integrated nature of economic activities

1.2 It is important to point out that the system of economic activities in any economy is highly integrated and cannot be easily singled out for the purpose of surveying of industrial activities only covered by this publication unless all units of production in the economy are first fully enumerated and clearly classified by type of activities. As will be later discussed in the chapter on statistical units, an enterprise which is a manufacturer may also have sub-units with their own account of production costs that involve in other activities such as financial activities or wholesale and retail trade. For example, a manufacturer may have a network to sell its own products and a separate unit that provides loans at a lower rate than market interest rate in order to stimulate the sale of its product. In such a case, manufacturing statistics should exclude the financial activities and distributive trade services, and the units producing these services should be classified and covered in financial and trade statistics. Similarly, a farming household may engage in agricultural production and also in manufacturing activity that produce goods such as bricks, furniture, etc. that should be classified as manufacturing. In order not to underreport and misclassify economic activities, all units in the economy must be first registered and classified properly before surveys are carried out. In the areas such as household and small scale economic units that are difficult to be enumerated, proper procedure must be articulated so that all economic activities are fully covered and properly classified in an integrated manner.

## C. Scope and structure of industrial sector in this publication

1.3 In general, industrial statistics are statistics reflecting characteristics and economic activities of the units engaged in a class of industrial activities that are defined in terms of the International Standard Industrial Classification of All Economic Activities, Revision 4 (ISIC Rev 4). The term "industry" thus refers to a class of ISIC, which encompasses all economic activities including agriculture and services producing activities in an economy, and is therefore much broader than the term "industry" that is popularly understood by the public, sometimes referring to manufacturing activities alone but sometime to a more expanded list of activities that may include besides manufacturing, construction, and mining.

1.4 The recommendations made in this publication on industrial statistics are relevant to a limited set of economic activities undertaken by all resident units in the reporting country that are engaged primarily in the following areas:

(1) Mining and quarrying (section B)
(2) Manufacturing (section C),
(3) Electricity, gas, steam and air conditioning supply (section D); and
(4) Water supply; sewerage, waste management and remediation activities (section E).

1.5 Industrial activities in international waters, such as the operation of petroleum and natural gas wells, should be included if these activities are subject to the laws, regulations and control of the country concerned.

1.6 The main recommendations included in this publication may also be applicable to other areas of economic statistics, particularly non-financial services. Other statistical publications will deal with special characteristics of some industries like distributive trade, construction, transport.

1.7 The coverage of activities at the most detailed (4–digit) level of ISIC Rev.4 in this publication is presented in Annex 1.

## D. General description of economic activities covered in the publication

A brief description of the coverage of economic activities within the scope of the industrial sector is given below.

1. *Mining and quarrying (Section B)*

1.8 This includes the activities relating to extraction of minerals occurring naturally as solids (coal and ores), liquids (petroleum) or gases (natural gas). Extraction can be achieved by different methods such as underground or surface mining, well operation,

seabed mining etc. Also included are supplementary activities aimed at preparing the crude materials for marketing, for example, crushing, grinding, cleaning, drying, sorting, concentrating ores, liquefaction of natural gas and agglomeration of solid fuels. These operations are often carried out by the units that extracted the resource and/or others located nearby.

1.9 Processing of extracted materials; crushing, grinding or otherwise treating certain earths, rocks and minerals not carried out in conjunction with mining and quarrying; usage of the extracted materials without a further transformation for construction purposes; and geophysical, geologic and seismic surveying activities are not included here.

2. *Manufacturing (Section C)*

1.10 This includes the physical or chemical transformation of materials, substances, or components into new products, although this cannot be used as the single universal criterion for defining manufacturing (see remark on processing of waste below). The materials, substances, or components transformed are raw materials that are products of agriculture, forestry, fishing, mining or quarrying as well as products of other manufacturing activities. Substantial alteration, renovation or reconstruction of goods is generally considered to be manufacturing.

1.11 Units engaged in manufacturing are often described as plants, factories or mills and characteristically use power-driven machines and materials-handling equipment. However, units that transform materials or substances into new products by hand or in the worker's home and those engaged in selling to the general public of products made on the same premises from which they are sold, such as bakeries and custom tailors, are also included in this section. Manufacturing units may process materials or may contract with other units to process their materials for them. Both types of units are included in manufacturing.

1.12 The output of a manufacturing process may be finished in the sense that it is ready for utilisation or consumption, or it may be semi-finished in the sense that it is to become an input for further manufacturing. For example, the output of alumina refining is the input used in the primary production of aluminium; primary aluminium is the input to aluminium wire drawing; and aluminium wire is the input for the manufacture of fabricated wire products.

1.13 Assembly of the component parts of manufactured products is considered manufacturing. This includes the assembly of manufactured products from either self-produced or purchased components.

1.14 The recovery of waste - the processing of waste into secondary raw materials - though may involve, physical or chemical transformations, this is not considered to be a part of manufacturing. However, the manufacture of new final products (as opposed to

secondary raw materials) is classified in manufacturing, even if these processes use waste as an input. For example, the production of silver from film waste is considered to be a manufacturing process.

1.15 Specialized maintenance and repair of industrial, commercial and similar machinery and equipment is included in manufacturing. However, the repair of computers and personal and household goods and the repair of motor vehicles are not included in this section.

1.16 The boundaries of manufacturing and the other activities can be somewhat blurry. As a general rule, the activities in the manufacturing section involve the transformation of materials into new products. Their output is a new product. However, the definition of what constitutes a new product can be somewhat subjective. As clarification, the following activities are considered manufacturing in the ISIC:

- milk pasteurizing and bottling
- fresh fish processing (oyster shucking, fish filleting), not done on a fishing boat
- printing and related activities
- ready-mixed concrete production
- leather converting
- wood preserving
- electroplating, plating, metal heat treating, and polishing
- rebuilding or remanufacturing of machinery
- tyre retreading

1.17 Conversely, there are activities that, although sometimes involving transformation processes, are classified in other sections of ISIC; in other words, they are not classified as manufacturing. They include:

- logging, classified in section A (agriculture, forestry and fishing);
- beneficiating of agricultural products, classified in section A (agriculture, forestry and fishing);
- beneficiating of ores and other minerals, classified in section B (mining and quarrying);

- construction of structures and fabricating operations performed at the site of construction, classified in section F (construction);

- activities of breaking bulk and redistribution in smaller lots, including packaging, repackaging, or bottling products, such as liquors or chemicals; sorting of scrap; mixing paints to customer order; and cutting metals to customer order, producing a modified version of the same product are classified to section G (wholesale and retail trade; repair of motor vehicles and motorcycles).

3. *Electricity, gas, steam and air conditioning supply (Section D)*

1.18 Economic activities included under this section are the activity of providing electric power, natural gas, steam, hot water and the like through a permanent infrastructure (network) of lines, mains and pipes. The dimension of the network is not decisive; also included are the distribution of electricity, gas, steam, hot water and the like in industrial parks or residential buildings. This section therefore includes the operation of electric and gas utilities, which generate, control and distribute electric power or gas. Also included is the provision of steam and air-conditioning supply. This section excludes the operation of water and sewerage utilities, (typically long-distance) and transport of gas through pipelines.

4. *Water supply; sewerage, waste management and remediation activities (Section E)*

1.19 This section includes activities related to the management (including collection, treatment and disposal) of various forms of waste, such as solid or non-solid industrial or household waste, as well as contaminated sites. The output of the waste or sewage treatment process can either be disposed of or become an input into other production processes. Activities of water supply are also grouped in this section, since they are often carried out in connection with, or by units also engaged in, the treatment of sewage.

## E. Outsourcing – boundary between manufacturing and wholesaling

1.20 The term 'outsourcing' of production has been used when the principal unit (i.e. principal) contracts another production unit (i.e. the contractor) to carry out specific aspects of the production activity of the principal, in whole or in part in the production of a good or a service. It should be noted that the activity classification of the contractor does not change with the outsourcing but that of the principal is very much affected by the nature and extent of the outsourcing.

1.21 The trend of outsourcing the manufacturing activities has been growing recently. It is imperative therefore, that the criteria for the classification of the principal outsourcing its economic activity have to be clarified to ensure international consistency

in its classification. It is recommended that the criterion on where to classify the principal should be based on the ownership of the physical input materials by the principal only.

1.22 There could be three cases of outsourcing, namely (a) outsourcing of support functions, (b) outsourcing parts of the production process and (c) outsourcing of the complete production process. In each of these cases, the principal and the contractor may be located within the same economic territory or in different economic territories. The actual location does not affect the classification of either one of these units. The classification rules for these cases are discussed below.

1. *Outsourcing of support functions*

1.23 In this case, the principal carries out the core production process (of a good or a service), but outsources certain support functions, such as accounting or computer services, to the contractor. In such a case, the principal remains classified to the same ISIC class that represents the core production process. The contractor is classified to the specific support activity it is carrying out, e.g. ISIC class 6920 (Accounting, bookkeeping and auditing activities; tax consultancy) or 6202 (Computer consultancy and computer facilities management).

2. *Outsourcing of parts of the production process*

1.24 The principal outsources a part of the production process (of a good or a service), but not the whole process, to the contractor. The principal owns the (material) inputs to be transformed by the contractor and thereby has ownership over the final outputs. In such a case, the principal is to be classified as if it were carrying out the complete production process. The contractor is classified according to the portion of the production process that it is undertaking. In case of the transformation of a good, the contractor is classified in the same or separate ISIC category. Also in the case of outsourcing of a service, the activities of the principal and the contractor might not be classified in the same ISIC category.

3. *Outsourcing of the complete production process*

1.25 Two specific cases have to be considered when the principal outsources the complete production process to the contractor, namely:

(a) the outsourcing of service producing activities including construction - in which case both the principal and the contractor are classified as if they were carrying out the complete service activity, and

(b) the outsourcing of manufacturing activities to contractor whereby the principal does not physically transform the goods at the location of its unit, the following activity classifications apply:

- A principal that owns the material inputs and thereby has economic ownership of the outputs, but has the production done by others, is

classified to section C (manufacturing), specifically to the classification category that corresponds to the complete (outsourced) manufacturing activity.

- A principal that has the production done by others, but does not own the material inputs, should be classified to section G (wholesale and retail trade; repair of motor vehicles and motorcycles), specifically to the classification category that corresponds to the activity characterized by the type of sale (e.g. wholesale or retail sale) and type of good sold. In this case, it should also be evaluated if the principal carries out other activities, such as design or research and development. If indeed other production activities are undertaken by the principal, the usual rules for identifying the principal activity of the principal should be applied.

- The contractor in such a case is classified to section C (manufacturing), specifically to the classification category that corresponds to the manufacturing activity performed by the contractor.

## F. Coverage of industrial activities

1.26 The field covered by statistics could be covered in terms of activities or in terms of establishments. It is desirable of course that all industrial activities should be covered, including the minor industrial activities of establishments which are predominantly non-industrial, and some countries aim at this coverage. However, a difficulty usually arises from the fact that separate statistics for the industrial part of an establishment with mixed activities may not be available because of the nature of the accounting data kept. In practice therefore, most countries find it better to divide the industrial from the non-industrial in terms of establishment; that is, by distinguishing between establishment which are predominantly industrial and those which are predominantly non-industrial, rather than attempting to cover industrial activities wherever they are carried on. An establishment which conducts several activities, but which is not organised to be treated as two or more statistical units is classified wholly in or wholly out of the industrial sector and the data reported for the establishment cover its secondary activities as well as its principal activities. This is commensurate with the general principle of classifying establishments according to their principal activity.

1.27 In conformity with the 1993 SNA production boundary, all units engaged in economic activities within the scope of this publication should be covered in the collection of industrial statistics. This embraces units of all sizes and types of ownership including the government and household units and sub-units embedded in other activities outside the scope of this publication such as manufacturing by general government sector.

1.28 Small-scale mining and quarrying, manufacturing and water supply activities engaged by households must also be covered. Also included are activities of units that

exist outside a household but have no established fixed industrial premises. Goods produced by households by engaging in industrial activities for own consumption should also be covered.

1.29 Departments, establishments and similar units in general government should be included if they are mainly engaged in producing goods and services classifiable within the scope of this publication, and identifiable by accounting records kept by the government, even though some of the units may not be operated for-profit or may not dispose of their output in the market. Such units may produce goods and services that, because of government policy, are sold at prices set below costs of production.

1.30 Government units may furnish goods and services to the government itself of a kind often provided by privately owned establishments. Examples are ammunition factories, navy dockyards, printing and publishing services. For these units, it is sometimes difficult to isolate their production activities since these units are embedded in the general government and are not established independently of the departments they serve. However, efforts should be made to encompass the activities in the scope of industries covered by this publication when they constitute a substantial part of the total national output of an industry and maintain accounts on cost of production and fixed assets used in production.

1.31 The actual enumeration of the establishments in the various activities will in practice vary according to the frequency with which the data are required, the difficulty of obtaining them, the existence of alternative sources and the resources available to the statistical authorities. The coverage recommended may be attained by a complete inquiry of the relevant establishments or by using sampling techniques. The method of enumeration chosen will depend on the circumstances in each country. Since circumstances differ, it is not possible to make international recommendations on this issue.

## G. Scope of industrial sector in terms of CPC

1.32 The Central Product Classification, version 2 (CPC Ver.2) of the United Nations (2007) constitutes a comprehensive classification of all goods and services. It presents categories for all products that can be the object of domestic or international transactions or that can be entered into stocks. It includes products that are an output of economic activity, including transportable goods, non-transportable goods and services. It serves as an instrument for assembling and tabulating all kinds of statistics requiring product detail. Such statistics may cover production, intermediate and final consumption, and capital formation etc. They may refer to commodity flows, stocks or balances and may be compiled in the context of supply and use tables, balance of payments and other analytical presentations. It provides a basis for recompiling basic statistics from their original classifications into a standard classification for analytical use.

1.33 All goods produced through industrial activities are classified in section 1 (ores and minerals; electricity, gas and water), section 2 (food products, beverages and tobacco; textiles, apparel and leather products), section 3 (other transportable goods, except metal products, machinery and equipment), and section 4 (metal products, machinery and equipment). The relevant services are classified in group 862 (support services to mining) group 863 (support services to electricity, gas and water distribution), divisions 87 (maintenance, repair and installation (except construction) services, except group 872 (repair services of other goods)), division 88 (manufacturing services on physical inputs owned by others and 89 (other manufacturing services; publishing, printing and reproduction services; materials recovery services). It is recommended that the CPC Ver.2 (or its national version developed by countries and fully compatible with the CPC) should be used for reporting industrial statistics.

# II. STATISTICAL UNITS

## A. An overview

2.1 The universe of economic entities is very vast. It varies from the small entities engaged in one or very few activities undertaken at or from one geographical location to large and complex entities engaged in many different activities that may be carried out at or from many geographical locations.

2.2 Economic entities engaged in the production of goods and services vary in their legal, accounting, organisational and operating structures. In large and complex entities, the units at which or from which production takes place are grouped for management, administrative, and decision-making purposes into hierarchical structures. Higher-level organisational units own, control, or manage the lower-level production units at which production decisions are made or production takes place. An economic entity may be structured along geographical, legal or operational lines. They may have one structure or several structures to carry out different functions or to serve different purposes.

2.3 In these entities, management of the financial affairs of the business usually occurs at a higher organisational level than does management of production operations. The accounting systems of businesses usually reflect this management structure by mirroring the hierarchy of management responsibility for the operations of the business. The accounts required to support the management and decision-making functions, whether financial or production, are usually maintained for the corresponding level of management responsibility.

2.4 From the point of view of the data collection, the most convenient way to obtain statistical data would be to collect them for entities for which complete sets of required records are available. This would allow statisticians to take advantage of information available from the accounting records of the producing entities and from administrative sources related to them. It would also result in statistics that, to a certain degree, serve best the interests of users because it makes it possible to relate administrative records to statistical surveys. However, since legal and operational structures of economic entities as well as their record keeping practices are not developed in most countries to suit statistical purposes, it is desirable to have guidelines for collection, reporting and statistical units to be used for the purpose of data collection and dissemination so that comparable national and international statistics can be produced.

2.5 The benefits of internationally comparable statistics can not be realised unless standardisation is applied to both definitions and classifications of transactors as well as transactions. If two or more statistical collections cover the same economic activity over time, meaningful comparison between data can not be made unless the object of comparison applies to the same units. The statistical unit serves as a tool to measure in an

unduplicated and exhaustive manner several aspects of the economy. In general, the utility of using standard classifications of activities, institutional sectors and geographic regions is weakened if they are applied to set of transactors which are not defined in a standard way. While the argument is often heard that standardisation imposed by statisticians results in rigidity of format and interpretation, it is in fact a basic tool in a scientific approach to any enquiry.

2.6 Economic entities have numerous characteristics and a variety of data are required about them that may be classified in many ways, among the most important of which are by institutional sector, by activity and by geographical region. The need to classify statistical units by these characteristics requires that they be as homogeneous as possible with respect to institutional sector, economic activity or location, and this plays an important role in defining the statistical units.

2.7 Another requirement that should be met by units used in statistics is that data on their activities are available or can be meaningfully compiled. It is obvious that no goal is served, when statistical units are created, to discover that they can not be used because no data using them could be obtained. The availability of data is a necessary but not a sufficient condition for defining a statistical unit as administrative records may be available for all kinds of entities which may be statistically irrelevant.

2.8 Statistics must also reflect the organisational structure of production. Units used in statistics should preferably be perceived by their managers and the outside world as viable and operational unit, i.e. they should have a relative degree of autonomy. The purpose of delineating different statistical units is to identify the economic actors in the economy, i.e. the levels in the organisation of an enterprise at which the financial decisions are taken on the one hand and the levels at which production decisions are taken on the other. Production decisions will more often than not be taken for the homogeneous process.

2.9 Statistical units may be defined following many criteria namely, legal, accounting or organisational criteria; geographical criteria; and production criteria. The relative importance of these criteria depends on statistical purpose of compilation and dissemination. A legal or institutional criterion helps in order to define units that are recognisable and identifiable in the economy. In some cases, legally separate units need to be grouped together as they are not sufficiently autonomous in their organisation. In order to define an institutional unit, accounting or financial criteria also have to be applied. Accounting criteria requires that an institutional unit keeps a complete set of accounts of its transactions. Organisational criteria states that enterprises are organisational units that have a certain degree of autonomy.

2.10 A unit can be geographically identified. Observational and analytical units are defined in such a way as to permit data to be compiled for local, regional and national economy. The rule regarding geographical criteria is helpful in order to permit consolidation and avoid omissions and duplications of units.

2.11 Production criteria suggest that entities engaged in similar economic activities be grouped together as it helps in analyzing homogeneous categories of goods and services produced in the economy following the application of homogeneous production technologies. Economic activities undertaken by statistical units are determined with reference to the specific categories of International Standard Industrial Classification of All Economic Activities (ISIC), Rev. 4.

## B. Statistical units

2.12 A *statistical unit* is an entity about which information is sought and for which statistics are ultimately compiled. It is the unit at the basis of statistical aggregates and to which tabulated data refer. These units can be divided into two categories.

(a) *observation units* – identifiable legal/organisational or physical entities which are able, actually or potentially, to report data about their activities;

(b) *analytical units* – entities created by statisticians (also referred to as *statistical constructs*), often by splitting or combining observation units in order to compile more detailed and more homogeneous statistics than it is possible by using data on observation units. Analytical units are not able to report data themselves about their activities, but there exist indirect methods of statistical estimation including imputation of such data. Examples of analytical units are unit of homogeneous production and local unit of homogenous production.

2.13 For operational purposes, a distinction is made between statistical, collection and reporting units. A *collection unit* is the unit *from which* data are obtained and by which questionnaire survey forms are completed. In fact, it is more a contact address than a unit. Sometimes the questionnaire is filled in by a central administrative office or an accountancy firm who provides this service to its client. Such information providing entities are collection units.

2.14 A *reporting unit* is the unit *about which* data are reported. Reporting units are those entities for which information is collected by means of questionnaires or interviews. Reporting units will, in most cases, coincide with the units for which statistics are compiled, like in the case of single-establishment enterprises where the enterprise and the establishment are identical. The reporting unit may or may not be the establishment. In the case of multi-establishment enterprises, however, the enterprise may make a separate return for each establishment, or each establishment may make a return for itself.

## C. Legal entities

2.15 Most societies provide for the legal recognition of economic entities, under laws that enable them to define and register themselves as legal entities. Legal entities are

recognized by law or society, independently of the persons or institutions that own them. The characteristics of a legal entity are that: they own assets, they incur liabilities, and they enter into transactions with other entities. The legal unit always forms, either by itself or sometimes in combination with other legal units, the basis for the statistical unit.

2.16 An example of a legal entity is a corporation that owns or manages the assets of the organisation, incurs liability on its own behalf, enters into transactions with other entities, receives and disposes of its income, and maintains complete set of accounts of its transactions.

## D. Types of statistical units

### 1. Institutional units

2.17 Institutional units are the core unit of the System of National Accounts. All subsequent definitions embody the definition of this basic unit. An institutional unit may be defined as an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities.

2.18 The main attributes of institutional units are: (a) An institutional unit is entitled to own goods or assets in its own right; it is therefore able to exchange the ownership of goods or assets in transactions with other institutional units; (b) It is able to take economic decisions and engage in economic activities for which it is itself held to be directly responsible and accountable at law; (c) It is able to incur liabilities on its own behalf, to take on other obligations or future commitments and to enter into contracts; and (d) Either it has a complete set of accounts, including a balance sheet of assets and liabilities, or it would be possible and meaningful, from both an economic and legal viewpoint, to compile for it a complete set of accounts, if required.

2.19 There are two main types of units in the real world that may qualify as institutional units. First type of units are persons or groups of persons in the form of households. The second type of units are legal or social entities whose existence is recognized by law or society independently of the persons, or other entities, which may own or control them such as a corporation, non-profit institution (NPI) or government unit. Such units are responsible and accountable for the economic decisions or actions they take, although their autonomy may be constrained to some extent by other institutional units; for example, corporations are ultimately controlled by their shareholders. Some unincorporated enterprises belonging to households or government units may behave in much the same way as corporations, and such unit are treated as quasi-corporations when they have complete sets of accounts.

2.20 Households are defined as a small group of persons who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food.

2.21 The individual members of multi-person households are not treated as separate institutional units. Many assets are owned, or liabilities incurred, jointly by two or more members of the same household while some or all of the income received by individual members of the same household may be pooled for the benefit of all members. Moreover, many expenditure decisions, especially those relating to the consumption of food, or housing, may be made collectively for the household as a whole. It may be impossible, therefore, to draw up meaningful balance sheets or other accounts for members of the household on an individual basis. For these reasons, the household, as a whole, must be treated as the institutional unit rather than the individual persons in it. An unincorporated enterprise that is entirely owned by one or more members of the same household is treated as an integral part of that household and not as a separate institutional unit, except when it has a complete set of accounts, in which case the enterprise is treated as a quasi-corporation.

2.22 The domestic economy is made up of the entire set of institutional units resident in the economy which are grouped into five mutually exclusive institutional sectors. The underlying criterion for grouping of units to sectors is the homogeneity of units as regards to economic objectives, principal functions and behaviour.

2.23 The following entities are deemed to be institutional units for the non-financial sector and relevant to this publication:

*(1) Legal entities which have a complete set of accounts and autonomy of decision taking:*

(i) Corporations – legal entities that are incorporated for the purpose of producing goods and services for the market, that may be a source of profit or other financial gain to its owner(s) and are collectively owned by shareowners that have the authority to appoint directors responsible for their general management.

(ii) Other incorporated entities - these are legal entities incorporated in other forms such as cooperatives, limited liability partnerships and non-profit institutions. These are all treated as corporations in the 1993 System of National Accounts.

(a) Cooperatives: entities in which each owner has an equal share of ownership.

(b) Limited liability partnerships - partners in these enterprises are both owners and managers and have legally limited liability.

(c) Non-profit institutions - legal entities that are set up for the purpose of producing goods and services, but their profits cannot be the source of income for the units that own them.

(iii) Quasi-corporations - legal entities set up by households or government units for the production of market goods and services. They may include public agencies which are part of general government or sole proprietorships and partnerships owned by households. These are unincorporated but function in all (or almost all) respects as if they were incorporated, therefore they are termed quasi-corporations. Such units either keep complete set of accounts of their transactions, or it would be possible and meaningful to compile a complete set of accounts if they were to be required. In the 1993 System of National Accounts they are included together with corporations.

(2) *Production units which do not necessarily keep a complete set of accounts, but which by convention are deemed to have autonomy of decision:* These units are unincorporated household enterprises that engage in the production of goods and services for own final use or for sale that are not legally separate from the households owning the unit.

2.24 In the majority of cases, an institutional unit will be a single legal entity. However, some corporations may be composed of legal entities set up for convenience as tax shelters or for other administrative reasons. In such cases, for statistical purposes it is inappropriate and unnecessary to regard each legal entity as a separate institutional unit.

2.25 If a an enterprise has a principal activity supported by units engaged in purely ancillary activities that are registered as separate legal entities, these should not be treated as separate establishments except when (a) such units are statistically observable (separate accounts of their production activities are readily available), or (b) these are located at geographically different locations from the enterprise they serve.

2.26 Because the institutional sector classification distinguishes separate non-financial and financial sectors, it is necessary to define two separate institutional units, for an entity engaged in non-financial and financial activities as long as the necessary financial accounts and balance sheets are available for each of them. The creation of a financial and non-financial unit is warranted even if the two together have all the other attributes of an institutional unit and consolidated accounts are compiled for them as a single unit.

## 2. Enterprise group

2.27 Enterprises under the control of the same owner form a group to achieve economic advantages such as, economies of scale, control of a wider market, increase in the domestic productivity through more effective business management. Integration economies lead to formation of vertical groups, where an enterprise takes control over

another enterprise either producing raw material or semi manufactures products (backward integration) or distributing and selling its final product (forward integration).

2.28 An enterprise group is a set of enterprises controlled by the group head. The group head is a parent legal unit which is not controlled either directly or indirectly by any other legal unit. It can have more than one decision-making centre, especially for the policy on production, sales and profits or may centralize certain aspects of financial management and taxation. It constitutes an economic entity which is empowered to make choices, particularly concerning the units which it comprises.

2.29 For certain observations and analyses it is sometimes useful and necessary to study the links between certain enterprises and to group together those which have strong ties with each other. It is also useful to recognize all (majority and minority) links between the group head and the controlled enterprise via the network of subsidiaries and sub-subsidiaries. This allows the group's entire organisation to be depicted.

2.30 The enterprise group unit is particularly useful for financial analyses and for studying company strategies, but it is too varied in nature and unstable to be adopted as the central unit for observation and analysis, which remains the enterprise.

## 3. Enterprise

2.31 An institutional unit in its capacity as a producer of goods and services is known as an enterprise. An enterprise is an economic transactor with autonomy in respect of financial and investment decision-making, as well as authority and responsibility for allocating resources for the production of goods and services. It may be engaged in one or more economic activities at one or more locations. An enterprise may be a sole legal unit.

2.32 The enterprise is the smallest legal unit that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise may, therefore, be a corporation (or quasi-corporation), a non-profit institution, or an unincorporated enterprise. Corporate enterprises and non-profit institutions are complete institutional units. On the other hand, the term “unincorporated enterprise” refers to an institutional unit - a household or government unit - only in its capacity as a producer of goods and services.

2.33 The enterprise is the basic statistical unit at which all information relating to its production activities and transactions including financial and balance sheet accounts are maintained and from which international transactions, an international investment position (when applicable), consolidated financial position and the net worth can be derived. It is also used for institutional sector classification of the 1993 System of National Accounts.

2.34 For institutional sector sequence of accounts, the enterprise is the basic statistical unit. However for production accounts, though the enterprise can serve as the basic statistical unit, the use of the establishment is preferable for two reasons:

(a) The identification of more detailed and therefore more homogeneous categories of economic activities, and

(b) The preparation of regional statistics.

## 4. Establishment

2.35 The establishment is defined as an enterprise or part of an enterprise that is situated in a single location and in which only a single productive activity is carried out or in which the principal productive activity accounts for most of the value added.

2.36 In other words, an establishment can be defined, ideally, as an economic unit that engages, under a single ownership or control - that is, under a single legal entity – in one, or predominantly one, kind of economic activity at a single physical location - for example, a mine, factory or workshop. This ideal concept of the establishment is applicable in many of the situations encountered in industrial inquiries, particularly in manufacturing.

2.37 Although the definition of an establishment allows for the possibility that there may be one or more secondary activities carried out in it but these should be small in magnitude compared with the principal activity. If a secondary activity within an establishment is as important, or nearly as important, as the principal activity, then the unit is more like a local unit. It should be subdivided so that the secondary activity is treated as taking place within an establishment separate from that establishment in which the principal activity takes place.

2.38 In the case of most small and medium-sized businesses, the enterprise and the establishment will be identical. Some enterprises are large and complex with different kinds of economic activities undertaken at different locations. Such enterprises should be broken into one or more establishments provided that smaller and more homogeneous production units can be identified for which production data can be meaningfully compiled. Because the establishments of a multi-establishment enterprise are part of the same legal entity, financial transactions and positions cannot always be attributed to a particular location or activity, so the enterprise is more suitable for compilation of financial statistics.

2.39 The establishment is particularly useful as a statistical unit for compilation and dissemination of information related to its production activities which include the following:

(a) Production of goods and services, revenues from sales of goods and services, all associated costs including employee remuneration, taxes on production and imports, subsidies, depreciation and a meaningful operating surplus;

(b) Employment information such as numbers of employees, types of employees and hours worked;

(c) Stock of non-financial capital used;

(d) Changes in inventories and gross fixed capital formation undertaken.

## 5. Other statistical units

2.40 The concept of the establishment combines both a kind-of activity dimension and a locality dimension. It is based on the assumption that the aim of the statistical program is to compile data classified both by activity and by geographical region. In circumstances in which precision in either the geographic or the activity dimension is not required, there are other units that may be used as statistical units for the compilation of production or production related statistics.

(a) *Kind-of-activity unit*

2.41 Although the way the enterprise unit is constructed and defined it may have already a certain degree of homogeneity with respect to its economic activities, some statistics such as production statistics in general and input output transactions tables in particular, may require a higher degree of homogeneity. For this purpose kind-of-activity unit is created. It allows statisticians to compile statistics that are as homogeneous as possible with regard to economic activities without restrictions in respect of geographic distribution. In order to obtain such homogeneous units, the enterprise must be partitioned into narrower and more homogeneous parts

2.42 Kind-of-activity unit is an enterprise or part of an enterprise which engages in only one kind of productive activity or in which the principal productive activity accounts for most of the value added. As compared to the establishment, in the case of such a unit, there is no restriction on the geographic area in which the activity is carried out.

2.43 The aim of creating the kind-of-activity units is to meet, as much as possible, the homogeneity requirement. The other two requirements, namely, data availability and organisational structure, should however not be disregarded. Splitting enterprises into kind-of-activity units must be a trade-off between homogeneity of economic activities on the one hand and the data availability and organisational structure on the other. The three requirements in most cases are interrelated: the more homogeneous one defines the unit, the fewer data would be available, and less it will be perceived as a separate entity in the

organisation. It is difficult to indicate how far splitting should go. It should certainly not go beyond a point where the entities obtained cease to be transactors in the economy.

2.44 Kind-of-activity unit is useful as the statistical unit for compiling production statistics where no geographic breakdown of the activities of enterprises is required. It has the required activity homogeneity. Each enterprise must, by definition consist of one or more kind-of-activity units. When partitioned into two or more kind-of-activity units, the resulting units must be more homogeneous with respect to output cost structure and technology of production than the enterprise as a whole. The enterprise's information system must be capable of indicating or calculating for each kind-of-activity unit at least the value of production, intermediate consumption, labour costs, the operating surplus and employment and gross fixed capital formation.

2.45 The kind-of-activity unit falling within a particular heading in the ISIC Rev.4 classification system can produce products outside the homogeneous group, on account of secondary activities connected with them which cannot be separately identified from available accounting records. Conversely, the kind-of-activity units classified under a particular heading in the classification system on the basis of a principal activity do not produce the entire output of homogeneous groups of specific products because the same products can be produced in secondary activities of kind-of-activity units falling under some other classification heading. The kind-of-activity unit may or may not be a reporting unit depending on the organisation of the enterprise accounts of which it is a part.

(b) *Local unit*

2.46 An enterprise often engages in productive activity at more than one location, and for some purposes it may be useful to partition it accordingly. Thus, a local unit is defined as an enterprise, or a part of an enterprise (for example, a workshop, factory, warehouse, office, mine or depot), which engages in productive activity at or from one location.

2.47 The expression “location” as it appears in the definition of the local unit and the establishment, can be interpreted in two different ways.

(a) First, there is the pure location in the narrow sense of the word, i.e. a specific site like an individual address or even a room in a multi storey office building. It may happen that two or more non-contiguous sites around the corner of the same block or just across the street are treated as one location when no separate records are maintained for each site. In general, the distance between two sites has to be quite large in order to justify a separate location, especially when the sites fall within different most detailed geographical area for which series of data are to be compiled.

(b) Second, the location may be the combination of all locations belonging to an enterprise within the geographical area. The identification of such a statistical unit allows for the distinction between provinces, states, counties, municipalities, townships are even smaller entities like mesh blocks. Therefore, if activities are exercised at two or more locations, e.g. in the same municipality, township or similar restricted geographic areas, covering all of these locations in one single local unit is acceptable from the point of view of the concept of the local unit.

2.48 Which of the two interpretations is to be used depends on the statistics in question. If, for instance, they are counting the number of factories or schools in a certain area, or if production processes are analysed, the location as an individual site is the appropriate unit; if, on the other hand, employment is the subject of statistics, all locations of an enterprise within the smallest geographic area could as well be taken together in one local unit. However, the decision on the definition of the location should be such that all related data may be collected to be analysed in an integrated manner.

(c) *Local kind-of-activity unit*

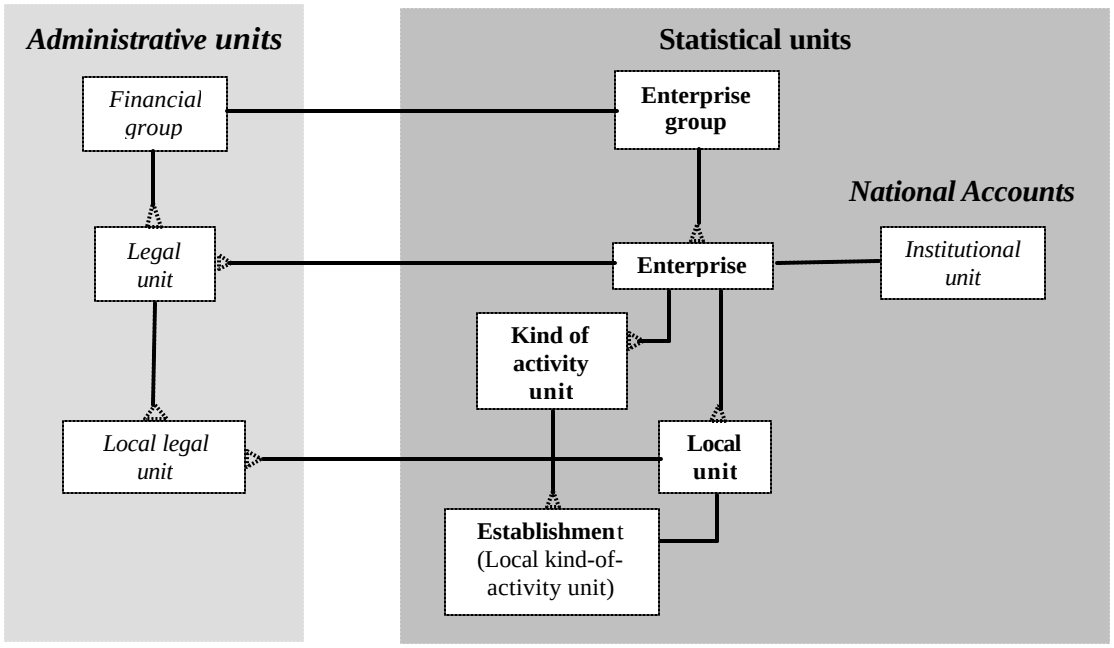
2.49 The local kind-of-activity unit is the part of a kind-of-activity unit which corresponds to a local unit. Each kind-of-activity unit must have at least one local kind-of-activity unit; however, the kind-of-activity unit can be made up of a grouping of parts of one or more local units. On the other hand, a local unit may in certain circumstances comprise solely a group of ancillary activities. In this instance, the 1993 SNA, Rev. 1 recommends that these ancillary units be treated as establishments. The local kind-of-activity unit corresponds to the establishment.

2.50 The relationships between concepts of activity and location are illustrated in the table 2.1 and diagram 2.1 depicts relationship between different types of statistical units.

**Table 2.1: Relationship between concepts of activity and location**

| | **One or more locations** | **One single location** |
|---|---|---|
| **One or more activities** | Enterprise group<br>Enterprise<br>Institutional unit | Local unit |
| **Near one single activity** | Kind-of-activity Unit (KAU) | Local KAU |

**Diagram 2.1: Relationships between different types of statistical units**




Note: A triangle means one or more entities can be linked to the entity on the other side of the line

(d) *Ancillary unit*

2.51 A productive activity undertaken with the sole purpose of producing one or more common type of services for intermediate consumption within the same enterprise is defined as an ancillary activity. These are supporting activities undertaken within an enterprise in order to create conditions within which the principal or secondary activities can be carried out. Examples of ancillary activities are: keeping records, communication, purchasing of materials and equipment, personnel management, warehousing etc. These are typically services that are likely to be needed, to some extent or other, in most enterprises, whatever the nature of their principal activities.

2.52 The main objective of the economic statistics collected using statistical units is that it should depict the economic phenomenon as close to reality as possible. This would require that the ancillary activity is treated as an integral part of the establishments or enterprise it serves because an ancillary activity is not undertaken for its own sake, but in support of the principal or secondary activity it is associated with. It means that neither the inputs into, nor the outputs from, ancillary activities are recorded separately from others consumed or produced by the principal or secondary productive activities. This way of recording the ancillary activity has the advantage of recording production processes in the way producers perform them, respecting their choices as to whether to

perform ancillary activities themselves or to outsource them. Besides this approach focuses on the description of production processes as they are organized in reality, ignoring legal structures put in place for various reasons. The advantage of integrating the ancillary activities with the establishments/enterprise they support is that it allows depicting the actual structure of an economy in respect of specialisation or integration of production processes.

2.53 This approach though depicts the production process as it is performed by the producers but it has the following disadvantages:

(a) Firstly, as the ancillary activity is consolidated with the economic activity of the establishment it serves, it is not recognized by its own activity classification, and as a result its production is not recognized and recorded independently. This treatment does not allow an assessment of the contribution and role of ancillary activities in the economy to be made, and so the structural decomposition of gross domestic product (GDP) by economic activity will not be disclosed correctly, and

(b) Secondly, the regional GDP can not be compiled accurately when the unit undertaking ancillary activities and the establishments it serves are located in different regions.

2.54 To overcome the disadvantages mentioned above, it may be desirable and useful to recognise a unit undertaking ancillary activities as a separate establishment – an ancillary establishment - in the following cases: namely,

(a) When an establishment undertaking ancillary activities is statistically observable, in that separate accounts for the production it undertakes are readily available, and

(b) When the ancillary units are in a geographical location different from the establishments they serve. Such an establishment should be allocated to the industrial classification corresponding to its own principal activity.

2.55 Units undertaking ancillary activities should be recognized as separate establishments, in cases mentioned above, only when enterprise information system is capable of indicating at least the value of intermediate consumption, compensation of employees, gross fixed capital formation and employment. Statisticians should not make extraordinary efforts to create separate establishments for these activities artificially in the absence of suitable basic data being available.

2.56 The output of ancillary establishment should be derived on a sum of costs basis, i.e. all costs of its production including the costs of the capital used in the production. The output will be deemed to be market output when the parent enterprise is a market enterprise and non-market otherwise. The output of the ancillary unit is treated as intermediate consumption of the establishments it serves and should be allocated using an

appropriate indicator such as the value added, output or employment of these establishments (see Box 2.1).

**Box 2.1: Imputation of the output of the ancillary activity and its allocation to establishments**

The example considered in Case 1 below represents an enterprise with two establishments and one headquarter (ancillary activity). For simplicity, the entire outputs of establishments are assumed to be for the market so that their outputs can be derived from sales. The national value added (VA) of the enterprise should be

VA = output 1 + output 2 – total intermediate consumption (IC)
= 200 + 100 - (100 + 30 + 30)
= 140.

**Case 1: An enterprise with two establishments and one headquarter (ancillary) unit**

| **Enterprise comprising** | | |
|---|---|---|
| **Establishment 1** | **Establishment 2** | **Headquarter** |
| $IC_1$ = 100 | $IC_2$ = 30 | $IC_3$ = 30 |
| $VA_1$= 100 | $VA_2$ = 70 | $VA_3$ = 15 [compensation of employees, consumption of fixed capital and other taxes on production = 15] |
| Output 1 = 200 | Output 2 = 100 | Output3 (imputed) = 45 |

In this case the headquarter (ancillary activity) should be treated as a separate establishment and classified according to its own activity (ISIC 8211). Its output (imputed on cost basis) should be distributed to the establishments 1 and establishment 2 in proportion to their output. The output of headquarter so distributed to establishments shall be treated as their intermediate consumption. Case 2 shows the allocation of the headquarters' output to each establishment (2/3 of the headquarters' output is allocated to establishment 1 and 1/3 to establishment 2). The allocation has been done using the output as the indicator.

**Case 2. Treatment of the headquarter (ancillary) unit as an establishment**

| | **Establishment 1** | **Establishment 2** | **Headquarter (treated as an establishment)** |
|---|---|---|---|
| | $IC_1$ =100 | $IC_2$ = 30 | |
| **Output 3 consumed as IC (allocated in proportion to output)** | 2/3 output 3 + 30 | 1/3 output 3 + 15 | $IC_3$ = 30 |
| | $VA_1$ = 70 | $VA_2$ = 55 | $VA_3$ =15 |
| | Output1 = 200 | Output2 = 100 | Output3 (imputed) = 45 |

After the allocation, the value added of the enterprise remains the same as before, which is equal to $VA_1+VA_2+VA_3$ = 70 + 55 + 15 = 140, but the value added for each establishment is reduced by the share of the intermediate consumption of the headquarter unit imputed to it.

2.57 An ancillary unit located abroad is always treated as a separate institutional unit and classified by sector and industry according to its own activity.

(e) *Multiterritory enterprises*

2.58 Some enterprises operate as a seamless entity across several economic territories. An enterprise has substantial activity in more than one economic territory, but it can not be broken up into a parent and branch(es) because it is run as a seamless operation, can not supply separate accounts for each territory. Such enterprises are typically involved in cross-border activities and include shipping lines, airlines, hydroelectric schemes on border rivers, pipelines, bridges, tunnels and undersea cables.

2.59 Governments usually require separate entities or branches to be identified in each economic territory for more convenient regulation and taxation. As a result, multiterritory enterprises usually have some sort of official approval for their arrangements.

2.60 In the case of multiterritory enterprises, it is preferable that a parent and separate branch(es) be identified. If possible, enterprises should be identified in each territory of operation according to the principles for identification of branches. If that is not feasible because the operation is so seamless that separate accounts could not be developed, it is necessary to prorate the total operations of the enterprise into the individual economic territories. The factor used for prorating should be based on available information that reflects the contributions to actual operations. For example, equity shares, equal splits, splits based on operational factors such as tonnage or wages could be considered. Where taxation authorities have accepted the multiterritory arrangements, a prorating formula may have been determined, which should be the starting point for statistical purposes. Prorating of the enterprise means that every transaction needs to be split into each component economic territory.

2.61 Some times an economic activity takes place in a territory which is under the joint jurisdiction of two sovereign States. The issues relating to recording of the economic activities in such a case are similar to that of the multi-territory enterprise. The same technique of prorating should be used for enterprises operating in zones of joint sovereignty or joint jurisdiction also.

## E. Statistical units for industrial statistics

2.62 For the inquiries dealt with in the present recommendations, the statistical unit should ideally be the establishment. The establishment is recommended as the statistical unit because it is the most detailed unit for which the range of data required is normally available. The data gathered, in order to be analytically useful, need to be grouped according to such characteristics as kind-of-activity, geographical area and size, and this is facilitated by the use of the establishment unit.

2.63 In practice, however, the ideal concept of the establishment cannot always be employed. The establishment may be part of an enterprise that engages in more than one kind-of-activity at a single location and the organisation and record-keeping practices of the enterprise may be such that separate data in respect of the outputs and corresponding inputs of the different classes of activity cannot be readily compiled. In this instance, it may be necessary to use the local unit - that is, all the economic activities carried on at a single location under a single ownership or control - as the statistical unit. However, if each of the various kinds of activity of a local unit is substantial and is carried on in distinct establishments, or if most legal entities are in a position to report on the activities separately, efforts should be made to divide the local unit into units comparable to the establishments, which can be delineated in most instances.

2.64 Thus, the organisation and record-keeping practices of producing units and the consequent limitations on the availability of data must be taken into account in defining the establishment for practical purposes. The establishment is, therefore, defined in operational terms as the combination of activities and resources directed by a single owning or controlling entity towards the production of the most homogeneous group of goods and services, usually at one location, but sometimes over a wider area, for which separate records are available that can provide data concerning the production of these goods and services and the materials, labour and physical resources used in this production. This definition of the establishment should make it possible to use the same unit for all statistics on the production of goods and services and the intermediate inputs, labour and physical capital resources used for this purpose. Where the establishment is used, it is important that it be defined identically in each inquiry so that the statistics will be comparable.

2.65 Tying the subdivision of the multi-establishment enterprise into establishments to the availability of records results, in most cases, in establishments that are in practice the same as local units. In other words, the records maintained usually do not permit the gathering of the required data for a more homogeneous group of productive activities than those carried out by the enterprise at its separate locations. This results in establishments that often embrace a range of related activities. However, in the case of very large local units that engage in several kinds of activity, as stated in paragraph 2.64, efforts should be made to divide them into separate establishments so as to limit the range of activities covered under each unit to that usually included in distinct establishments.

2.66 In the case of mining, the definition of location should be such that the establishment includes the enterprise's collection of wells, shafts or pits that tap a single field. Any ore-dressing or ore-beneficiating plants located at the mine site should be included as part of the establishment. In the case of producers of electricity, gas and water, the establishment should be defined to embrace the producing plant and its associated distribution system, including, for the electricity industry, the transformer stations. However, for geographical information some limits may have to be set in terms of the areas used for statistical purposes.

2.67 Because of the nature of the electricity, gas and water industries, it may be advantageous to omit this ISIC major division from the general inquiry and to collect the required information from the responsible authorities. In order to avoid any overlapping or omission when following this practice, the status of electric power plants producing primarily for internal use should be determined. Where these are covered by the authorities, they should be considered as units engaged in secondary activities which have already been classified in terms of their own activity. Otherwise, they should be treated as ancillary units and their activities treated as suggested in paragraphs 2.51-2.57.

2.68 The kind-of-activity unit differs from the establishment in that there is no restriction in respect of the geographical area in which a given kind-of-activity is carried on by a single legal entity. In certain instances, the availability of data on a kind-of-activity-unit basis may suggest the employment of this unit in industrial inquiries rather than the establishment. For example, in some cases, data on fixed capital formation, stocks, new orders and sales may be available easily in respect of kind-of-activity units but not of establishments, at the same time, interest in the classification of the data according to area or size of establishment may be minimal. More generally, the kind-of-activity unit may, for many purposes, be considered a suitable alternative to the establishment in those countries where the larger multi-establishment enterprises organize their records on this basis. If the kind-of-activity unit is used in such cases, it would, however, be useful to indicate the relationship between these units and the units used in other inquiries of the system.

2.69 It would appear that the most successful attempts to integrate establishment-enterprise activity have been accomplished by using the enterprise as the collection unit. In this approach, enterprises are classed as single-establishment or multi-establishment. The single-establishment enterprise receives a complete questionnaire covering all items of data. Establishments belonging to multi-establishment enterprises are asked to report only on data relating to their production activities available with them and the remaining data items are requested from the concerned enterprise.

2.70 The determination of whether the items of data are appropriate at the establishment or enterprise level is made by the national authorities, but the ultimate responsibility for providing complete returns rests with the enterprise. For example, in some cases items included in the establishment return may better be completed at the enterprise level, either by apportionment or based on enterprise records. Usually items requiring such treatment are contained in the enterprise questionnaire, which can be used for establishment data only through the use of estimation. Also, for small single-establishment enterprises, it is only feasible to collect a limited amount of data. Estimates, therefore, have to be made for the items omitted for these enterprises.

2.71 Two main types of data are required to describe the financial and production activities of the units of which the economy is composed: (a) financial statistics organized by institutional or other sectors and (b) production statistics classified by economic activities and, in some countries, by geographical area(s). The two types of data are required separately, as well as integrated into the system of national accounts.

Recognizing that the System of National Accounts recommends the establishment as the most appropriate statistical unit for production and employment data, countries are encouraged to use establishment as a statistical unit for the purpose of industrial statistics to ensure the homogeneity of the economic activity and its geographic distribution. However, the choice of statistical unit can be guided also by factors such as purpose of the study, users need, the availability and quality of requisite data. Therefore, the enterprise also can be used as the statistical unit. In majority of the cases the establishment and the enterprise are the same except in the case of the multi-establishment enterprises.

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## F. Statistical units of the informal sector

2.72 Small and unorganised enterprises play an important role in the developing countries in terms of production and generation of employment. These production units are part of the household sector and are characterized by high rates of birth and death and considerable mobility essentially differing from the formal sector in terms of technology, economies of scale, use of labour intensive processes, and virtual absence of well maintained accounts. Such units belong to the informal sector. The informal sector as an economic phenomenon manifests itself in different ways in different countries. A large number of these units carry out economic activities without a fixed location, in homes, small shops or workshops. Informal activities may range, for example, from street vending, shoe shining and other activities that require little or no capital and skills to activities that involve a certain amount of investment or level of skills such as tailoring and car repair. Many informal sector enterprises are operated by an individual working either alone, as self-employed entrepreneur, or with the help of unpaid family members, although other informal micro-entrepreneurs may engage paid workers.

2.73 The informal sector is defined by the International Conference of Labour Statisticians (ICLS) resolution according to the types of production units of which it is composed (ILO 1993b). It consists of a sub-set of household unincorporated enterprises with *at least some production for sale or barter* and they operate within the production boundary of the SNA. These units typically operate at a low level of organisation, with little or no division between labour and capital as factors of production and on a small scale. Labour relations, where they exist, are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements with formal guarantees. The informal sector thus defined excludes household enterprises producing exclusively for own final use. Countries may use additional criteria described in paragraph 2.75 to further restrict the scope of the informal sector. Although different options for defining the scope of the informal sector enterprise exist, the informal sector is always a sub-set of household unincorporated enterprises, which operate within the limits of the households sector among the institutional sectors of the SNA.

2.74 As household production units, these enterprises do not constitute separate legal entity independently of the household members who own them. Fixed and other capital used does not belong to the enterprise as such but to the household members. As

expenditure for production is often indistinguishable from household expenditure and capital equipment such as buildings or vehicles may be used indistinguishably for business and household purposes, these enterprises do not keep complete set of accounts, thus can not be treated as quasi-corporations and classified to the corporate sector.

2.75 Apart from household enterprises with units producing at least some goods and services for sale or barter, the ICLS definition of informal sector contains additional enterprise-based criteria about the size of employment, the non-registration of the enterprise and/or its employees of which their application may vary depending on national considerations and circumstances. These additional criteria are applied to restrict the scope of household enterprises to the following two sub-sets of enterprises in the informal sector:

(a) *Own-account enterprises*: either all own-account enterprises may be considered informal, or only those not registered under specific forms of national legislation (such as commercial laws, tax and social security laws and regulatory laws).

(b) *Enterprises of employers*: enterprises may be considered informal if they meet one or more of the following: (1) small size of the enterprise in terms of employment, (2) non-registration of the enterprise, and (3) non-registration of its employees.

2.76 With these additional criteria, the production unit in the informal sector is defined as a household enterprise with at least some production for sale or barter for which one or more of the criteria of a limited size of employment, the non-registration of the enterprise and/or its employees are met.

2.77 Apart from defining the informal sector, the 15th ICLS recommended the following additional considerations about the scope of informal sector and its statistical treatment.

(a) In principle, all goods and services producing activities are within the scope, which might be aggregated.

- agricultural activities (section A) are measured separately from other economic activities to ensure international comparability and the selection and application of appropriate statistical data collection tools and sample design.

- activities of households as employers of domestic personnel (ISIC 97) with households being producers for own final use are outside the scope of the informal sector.

(b) Geographical coverage includes both urban and rural areas even if preference may be given initially to informal enterprises operating in urban areas.

(c) Outworkers are included if the production units they constitute as self-employed persons or for which they work as employees meet the enterprise-based criteria.

# III. CHARACTERISTICS OF STATISTICAL UNITS

3.1 Statistical units are characterised by a number of descriptive variables that are useful for their proper identification. These characteristics are helpful in the collection of information about units and their structures; to provide sampling basis for statistical surveys and to permit comparisons and links to be made between data from different data sources thus, significantly reducing the duplication in data collection and response burden. The main characteristics of the statistical units are identification code, location, kind-of-activity, type of economic organisation, type of legal organisation and ownership, size and demographic characteristics.

3.2 The annual and short-term business statistics on individual establishments and enterprises allows for four distinct types of analysis based on the characteristics of the units of production by making use of the coherence of concepts, definitions and data items across economic activities, geographical areas, size classes and ownership of the enterprises:

- Geographical analysis – this analysis allows for detailed analysis of performance between regions of an economic territory, between different member states, between sub-regions region as compared to the world total.

- Activity analysis – this analysis pertains to the structure or business cycle of production of one activity or to the comparison of relative performance of several activities within or between reference periods.

- Legal and ownership analysis – This analysis allows for comparison of performances across the various ownership and control like public, private and foreign-owned enterprises by economic activities and between economic activities.

- Size class analysis - this analysis shows the relationship between the various sizes of enterprises and their activity and performance, as well as the different size structures of the activities by providing an indication of the degree of concentration and competition. Moreover, it allows for analysis of employment and performance differences between smaller and larger enterprises. This type of analysis is particularly important for studying business demography.

## A. Identification code

3.3 The identification code is a unique number assigned to a statistical unit which may comprise digits identifying its geographic location, kind-of-activity, whether a unit is a principal producing unit or an ancillary unit, link to its subsidiaries/principal if any etc.. The unique identification of statistical units is necessary in order to: (i) allow their registration in statistical business register or inclusion sampling frame; (ii) permit the

collection of information about them via administrative sources; (iii) provide a sampling base for statistical surveys; and (iv) permit demographic analysis of the population of units. Identification code must not change throughout the life of the unit, although some of the other unit's characteristics may change. Common identification codes, shared with administrative authorities and other government departments greatly facilitate the statistical work, including the connection of the statistical business register, if such is established, with other registers.

## B. Location

3.4 The location is defined as the place at which the unit is physically performing its activities not as where its mailing address is. This characteristic serves two important purposes. First, to identify the units and to classify them by geographical regions, at the most detailed level as demanded by the statistical programme. Second, if a unit operates in more than one locations, to allocate its economic activity to the location in which it actually takes place. The latter is important for measuring regional output (regional GDP and other economic indicators) and making regional economic analyses. Since the classification of units by location is of particular national interest, any geographical classification should distinguish the major economic regions or administrative divisions of the country ranging from large areas (states or provinces) to intermediate areas to local areas (towns).

3.5 The details about mailing address, telephone and fax numbers, e-mail address and contact person are also important identification variables since these details are used for mailing the statistical questionnaires, written communication with the unit or making ad-hoc queries about its activity. Up-to-date information about any changes in those variables is crucial for the efficient work of statistical authorities.

3.6 *Location in case of multi-establishment enterprises*. Where an enterprise has only one establishment; they may or may not have one location and address. Often, the enterprise address is used for administrative purposes and the establishment address for statistical purposes. There is a need, however for care when dealing with large complex enterprises. It is recommended that the multi-establishment enterprise be requested to provide location details about each establishment it has, or the establishment may be asked about the name and location of the enterprise that owns it so that a data set in the register on the enterprise and its own component establishments can be established. In some cases, it may be necessary to correspond with both the establishment and the enterprise because in general, the unit supplying for example employment details is different from one providing financial details.

## C. Kind-of-activity

3.7 The kind-of-activity is defined as the type of production in which a unit is engaged. The kind-of-activity characteristic is the principal variable which determines

whether or not a given statistical unit is included in scope of industrial statistics and to which activity class it belongs. The kind-of-activity of the statistical unit should be determined in terms of ISIC, Rev. 4.

3.8 Many countries have developed national adaptation of the ISIC to meet their national requirements and circumstances. For countries following a different scheme of national classification, it is recommended that full correspondence with the national classification is realised at 2-digit ISIC Rev 4 (i.e. at the division level).

3.9 Each establishment unit should be classified to one kind-of-activity class in the national system of economic classification which is preferably compatible with the ISIC Rev 4 at least at 2-digit level. Secondary activities are to be disregarded when classifying a unit. The principal activity of the unit in general can be determined from the goods that the unit produces or the services that it renders to other units or consumers.

3.10 An activity that contributes most to the value added of the unit, or the activity the value added of which exceeds that of any other activity undertaken by the unit is called its *principal activity.* It is not necessary that the principal activity account for 50 per cent or more of the total value added of a unit.

3.11 A *secondary activity* is an activity carried out within a single producer unit in addition to the principal activity and whose output, like that of the principal activity, must be suitable for delivery outside the producer unit. The value added of a secondary activity must be less than that of the principal activity, by definition of the latter. The output of the secondary activity is a secondary product. Most units have at least some secondary activities.

3.12 A productive activity undertaken with the sole purpose of producing one or more common type of services for intermediate consumption within the same enterprise is defined as an *ancillary activity.* Examples of ancillary activities are bookkeeping, transportation, storage, purchasing, sales promotion, cleaning, repair and maintenance, security etc. At least some of these activities are found in every unit. By definition, ancillary activities are those that are carried out to support the principal and secondary activities of a unit by providing services entirely or primarily for the use of that unit.

3.13 Ancillary activities are treated as part of the main establishment which they serve and therefore are to be disregarded when classifying a unit except when units engaged in such activities (a) are statistically observable (separate accounts of their production activities are readily available), or (b) these are located at geographically different locations from the corporation they serve (see para 2.54). In such cases, the unit undertaking ancillary activity is treated as a separate establishments and its activity classification should be determined by its own activity.

3.14 To determine the kind-of-activity of the statistical units in terms of ISIC Rev. 4, the following general principles should be followed:

(i) The kind-of-activity of a statistical unit is determined by the kind of its principal activity; secondary and ancillary activities (except when units undertaking ancillary activities are identified as separate establishments) are to be disregarded when classifying a unit;

(ii) If the unit is engaged in several types of independent activities, but the unit itself cannot be segregated into separate statistical units, its kind-of-activity should be determined according to the ISIC class with the largest share of value added by using the "top-down" method. The "top-down" method means that first the appropriate highest classification level (1-digit) should be determined, then the lower (2- and 3-digit) levels and finally the class (4-digit level). An example illustrating the application of "top-down" method is presented in Annex 2;

(iii) In cases where the value added cannot be determined for the activities involved, the principal activity should be determined using other criteria provided these are applied consistently overtime to different activities involved. The following alternative criteria are recommended:

(a) based on output: output of the unit that is attributable to the goods or services associated with each activity; and value of sales, shipment or transfers to other establishments of those groups of products falling within each activity;

(b) based on input: wages and salaries attributable to the different activities; or employment in the activities according to the proportion of people engaged in the different activities of the unit.

3.15 Instances may arise where considerable proportions of the activities of a unit are included in more than one classes of ISIC. These cases may result from horizontal or vertical integration of activities.

*Classification of statistical unit engaged in horizontally integrated activities*

3.16 Horizontal integration occurs when an activity results in end-products with different characteristics. This could theoretically be interpreted as activities carried out simultaneously using the same factors of production, for example production of electricity through a waste incineration process. The activity of waste disposal and the activity of electricity production cannot be separated in this case.

3.17 In the case of horizontally integrated activities, it will generally not be possible to separate them statistically into different processes, assign them to different units or generally provide separate data for these activities, nor will rules relying on allocation of value added or similar measures are applicable. Alternative indicators, such as gross output, may sometimes be applicable, but there is no general rule for identifying the single activity that best represents the mix included in this horizontal integration.

Countries may develop their own rules for such identification and include them in the metadata for national and international dissemination.

*Classification of statistical unit engaged in vertically integrated activities*

3.18 A vertically integrated enterprise is the one in which different stages of production, which are usually carried out by different enterprises, are carried out in succession by different parts of the same enterprise. The output of one stage is used as input into the next stage and most of or only the output of the final stage is actually sold on the market. There are numerous examples of vertically integrated enterprises. For example, an enterprise may use its own fishing fleet to catch the fish it then processes into frozen or canned food products, i.e., manufactured products. Similarly, an enterprise may grow corn to produce methanol. In these examples the vertical integration extends beyond different stages of manufacturing by integrating fishing or agriculture, with manufacturing.

3.19 The vertically integrated enterprise should generally be treated like any other form of multiple activities, i.e. a unit with a vertically integrated chain of activities should be classified to the class corresponding to the principal activity within this chain, i.e. the activity accounting for the largest share of value added, as determined by the top-down method. If value added or substitutes for the individual steps in a vertically integrated process cannot be determined directly from accounts maintained by the unit itself, comparisons with other units (e.g. based on market prices for intermediate and final products) could be used. If it is still impossible to determine the share of value added (or its substitutes) for the different stages in the chain of production activities, default assignments for typical forms of vertical integration can be applied.

3.20 The principal activity of producer units may change from one statistical period to the next, either because of seasonal factors or the management decision to vary the pattern of output. This necessitates the change of classification of the unit. Frequent changes however, need to be avoided as it may distort the statistics rendering its interpretation difficult.

3.21 Countries are encouraged to develop a stability rule. Without such a rule there would be apparent changes in the economic demography of the business population which would be no more than statistical artefacts. The recommended working rule is that the secondary activity should exceed the activity to which the unit is classified for two years before the activity classification is changed. Similarly, if a unit engages in a mix of activities that are almost balanced, raising the risk of changes for the principal activity, the ratio of activities over the past two to three years should be taken into account for determining the principal activity.

3.22 It is recommended that countries change the activity classification of units for the purpose of statistical inquiries no more than once a year, either at a fixed date or as the information becomes available. More frequent changes would result in inconsistency between infra-annual and annual statistics.

## D. Type of economic organisation

3.23 The enterprise and the establishment are the main units used by countries for conducting industrial surveys. The characteristic "type of economic organisation" is intended to indicate whether the establishment is *the sole establishment* of the enterprise of immediate ownership or is a part of a *multi-establishment enterprise*. If further details are required on this aspect of the industrial structure, the multi-establishment enterprises might be divided into classes according to the number of their constituent establishments or by the criteria used for classifying establishments (employment, value added) that are most appropriate for each country.

3.24 For the purpose of accurate measurement of production and all other flows of goods, services and capital in the economy, it is desirable to have the links between individual establishments and their parent enterprise clearly defined. More importantly, these links are fundamental for the efficient sampling design because one survey might gather information on value added, employment and production statistics usually available at establishment level, while another may collect data from consolidated financial statements compiled mainly at the enterprise level.

## E. Type of legal organisation and ownership

3.25 The kind of *legal organisation* is another important characteristics and possible criterion for stratification of economic entities in statistical surveys. The kind of legal organisation is the legal form of the economic entity which owns the unit (either the enterprise or the establishment). Further breakdowns of incorporated units by *incorporated enterprises* (corporations) except limited liability partnerships and co-operatives, *limited liability partnerships* and *co-operatives*, and *non-profit institutions;* and of unincorporated units by sole proprietors and partnerships not recognized as independent legal entities may also be of interest.

3.26 Incorporated enterprises can be divided into two types: corporations and other incorporated enterprises which may be separated into cooperatives, limited liability partnerships and non-profit institutions. The grouping based on legal organisation would facilitate the choice of appropriate types of surveys to be organised for data collection from these units which could be economical and convenient to implement.

3.27 The producer units may be classified by kind of legal organisation as follows:

(a) *Incorporated enterprises*

- *Corporations* – legal entities that are incorporated for the purpose of producing goods and services for the market, that may be a source of profit or other financial gain to its owner(s) and are collectively owned by shareowners who have the authority to appoint directors responsible for their general management;

- *Other incorporated entities* - legal entities created for the purpose of engaging in market production of goods and services for profit but incorporated in other forms such as:
    (i) *Cooperatives* - enterprises set up by producers for purposes of production and marketing their collective output in which each owner has an equal share of ownership;

    (ii) *Limited liability partnerships* - in these enterprises, partners are both owners and managers and have legally limited liability;

    (iii) *Non-profit institutions* - legal entities that are set up for the purpose of producing goods and services, but their profits cannot be the source of income for the units that own them.

(b) *Unincorporated enterprises* are units set up for producing goods or services which are not incorporated as legal entities separately from their owners. They may include public agencies which are part of general government or sole proprietorships and partnerships owned by households. Some unincorporated enterprises may behave in much the same way as corporations and such entities are treated as *quasi-corporations* if they have complete sets of accounts, including balance sheets.

3.28 *Non-profit institutions* are legal or social entities created for the purpose of producing goods and services whose status does not permit them to be a source of income, profit or other financial gain for the units that establish, control or finance them. In practice, their productive activities are bound to generate either surpluses or deficits but any surpluses they happen to make cannot be appropriated by other institutional units. Only those non-profit institutions are within the scope of industrial inquiry which sells most of its output at economically significant prices. They consist mainly of chambers of commerce and industry, industry associations or industry employers' organisations. These NPIs are usually financed by contributions or subscriptions from the member units. Subscriptions are treated as payments for services rendered and not as current transfers.

3.29 Unincorporated units that are engaged in commercial activities and either keep complete set of accounts of their transactions, including balance sheet or it would be possible and meaningful to compile a complete set of accounts if they were to be required, are called quasi-corporations. The concept of a quasi-corporation is intended to separate from their owners those unincorporated units that are engaged in commercial activities and are sufficiently self-contained and independent from their owners and which behave in the same way as corporations. However, experience has shown that distinguishing the quasi-corporations owned by households in certain cases might be difficult.

3.30 The classification of units by their legal forms has more national rather than international significance; therefore, it has to be developed in accordance with the legal forms or categories adopted by each country.

3.31 *Type of ownership:* In addition to the kind of legal organisation, it is considered useful to distinguish the type of ownership, i.e., between the *private* ownership and the various forms of *public* ownership of units.

3.32 The criterion to distinguish between privately and publicly owned units should be based on whether the ownership of the enterprise to which the establishment belongs rests with public authorities or private parties. Public units are defined as those units that are owned or controlled by government units. To be classified as a public corporation, an institutional unit must not only be controlled by another public unit, but it also must sell most of its output at economically significant prices. Control is defined as the ability to determine the general policy or program of an institutional unit. Government is in a position to exercise control over many kinds of units: miscellaneous extra-budgetary agencies, non-profit institutions and corporations (non-financial or financial). It is recommended that national statistical offices should consult the 1993 SNA Rev. 1 to have a clearer understanding of the delineation process. However, countries may apply more simpler and clearer rule as the Eurostat, which defines that control is secured by the government when the government unit owns more half of the voting shares or when special legislation decree or regulation exists which empowers the government to determine corporate policy or to appoint directors (Eurostat 1995)[1].

3.33 By contrast, the privately owned units are those owned or controlled by private parties. The public authorities or private parties are considered to be the owners of a given enterprise if they own all, or a majority, of the unit's shares, or of its other forms of capital participation. The control over a unit means the ability to determine the unit's policy by appointing appropriate directors, if necessary.

3.34 The category of publicly owned units may be further disaggregated into the main divisions of public ownership in each country, which would normally differentiate between central government ownership, ownership by state or provincial governments and ownership by local authorities. Within the group of privately owned units, a further classification of ownership, which differentiates between nationally owned and foreign controlled units, may also be introduced.

3.35 For cross-classification of units by type of ownership and kind of legal organisation, the following abbreviated version is recommended:

1. Incorporated enterprises except cooperatives and limited partnerships and cooperatives
    a. Public ownership
        (i) By central government

[1] European System of Accounts, ESA 1995, Eurostat, para. 2.26.

(ii) By state or provincial governments
(iii) By local governments

b. National private
c. Foreign controlled

2. Cooperatives and limited liability partnerships
   a. Public ownership
      (i) by central government
      (ii) by state or provincial governments
      (iii) by local governments

   b. National private
   c. Foreign controlled

3. Non-profit institutions
   a. Public ownership
      (i) By central government
      (ii) By state or provincial governments
      (iii) By local governments

   b. National private
   c. Foreign controlled

4. Unincorporated enterprises

## F. Size

3.36 A size measure of a statistical unit is an important stratification characteristic, essential for sample design and grossing up techniques. In general, the size classes of statistical units can be defined in terms of physical units like employment or in monetary units like, turnover or amount of net assets. Monetary criteria can be used separately or in conjunction with employment criterion.

3.37 A definition of size based on the average number of persons employed is recommended for the purpose of the present recommendations because of its simplicity, general applicability, usefulness and international comparability. Employment data are more readily available (including employment data for small units) in most of the countries and do not require additional statistical calculations and adjustments.

3.38 The size of a statistical unit based on employment should be primarily defined in terms of the average number of persons employed in that unit during the reference period. If the average number of persons employed is not available, the total number of persons employed in a single period may be used as the size criterion. The size classification should consist of classes of the following sizes measured in terms of the average number

of persons employed: 1-9, 10-19, 20-49, 50-249, 250 and more. This should be considered a minimum division of the over-all range, more detailed classifications, where required, should be developed within this framework.

3.39 In order to maintain the international comparability of data, countries are encouraged to follow the proposed classification to the extent possible. It is recognized however, that differences resulting from administrative, organisational or legal reasons may exist at national level. In addition, the wide variety of employment particularly in small units with part-time and unpaid family workers may also complicate the classification of size based on employment.

3.40 The employment in full-time equivalence (FE) can also be used as criteria for classifying statistical units by size. This measure provides more accurate measurement of employment for productivity studies because of the increasing tendency to use part-time workers.

3.41 By definition full-time equivalent employment is the number of total hours worked divided by average annul hour actually worked in full time jobs. Conceptually, in full-time equivalent measures, part-time employed persons are counted with a smaller weight than are persons working full-time. The full-time equivalent measure should avoid the bias arising from a shifting share of part-time employment in the workforce but will not adjust for changes in the number of hours which constitute a full-time job, namely, as consequence of changes in legislation or collective agreements. The concept of full-time equivalence does not, therefore, make the data necessarily comparable since it may vary significantly from country to country. It may also not be possible to calculate employment in full-time equivalence in some countries due to the paucity of detailed data on hours worked.

3.42 Another problem in the count of employees is the existence of a number of persons who are paid by the establishment but whose status is not clear, for example, employees working entirely on commission, mainly on commission with a small retaining fee or working for more than one employer. One way to deal with such a problem might be to count as employees only those who receive a regular salary while those who receive only or mainly commissions might be dealt with in a way similar to out-workers in the context of the manufacturing industry. That is, the payments they receive should be included as part of the cost of contract and commission work rendered by others and their number, if available, should be shown separately only as a memorandum item.

3.43 For some types of surveys or analyses alternative means of measuring the size of the unit in terms monetary criteria such as turnover, value added, or investment in fixed assets may also be of interest either alone or in conjunction with the employment criterion. The size distribution of units based on monetary variable could only be a second best criterion as it has limited application for international comparisons because of the problems associated with the conversion to a common currency besides it is not suitable for longer time series analysis.

## G. Demographic characteristics

3.44 The demographic characteristics provide information about the period of economic activity of a given unit and include the date of commencement and cessation of its activity. Given the dynamics of creation (birth)/cessation (death) of economic unit in the economy, the demographic characteristics have also their significance for identifying units as a target population for statistical surveys. Moreover, where the statistics about the demography of units exists on a regular basis, it can provide useful information on the rate of creation, of new units, the chance of units survival and the differences in dynamics of units between ISIC activities. Such indicators allow the trends in the population to be analysed.

3.45 In principle, the date of recognition (the birth or other creation date) of the unit exists and is stored in the business register or area frame. However, due to a slow administrative process of death registration or cessation of unit's activity or the intention of the unit to resume its activity after an indefinite period of time, it is more difficult to obtain information about the date (period) at which the unit actually ceases its activity. Therefore, between the period of operation and death of the unit, there might be a period of inactivity, in which the unit will be considered as "dormant". The information on births and deaths of units may be obtained also from administrative sources such as fiscal or juridical authorities, social security or an update of area frames through inter census enumeration, while statistical surveys will detect the status of the unit – i.e. whether the unit is active or dormant (inactive) or ceased its activity.

3.46 There is a growing demand from a wide range of users for production of internationally comparable statistics on business demography of statistical units. The key events for these statistics are births and deaths, however other events such as break-ups, split-offs, mergers and takeovers, etc. are also relevant when determining whether or not a statistical unit has survived from one period to another. Business demography statistics is generally compiled using the enterprise as a statistical unit and the business register as a preferred source of information. It is recognised that non availability of up-to-date business register in many countries limits the international comparability of business demography statistics. Countries may refer to the *Eurostat-OECD Manual on Business Demography Statistics* (Eurostat 2007) for further practical and theoretical guidance in this area of statistics.

# IV. DATA ITEMS AND THEIR DEFINITIONS

4.1 The present chapter provides summary definitions of data items of industrial statistics recommended for collection and publication, together with additional items of data derived from the basic system. Some of the data items may not be existent or they may be of minor importance for some of the economies. Compilers are encouraged to use the list of data items as reference in order to develop a list of data items in accordance with their own statistical circumstances, respondent load and available resources and having determined the data items should consistently use the definitions presented.

## A. Understanding the links between business accounting and business statistics

4.2 The records of transactions maintained by businesses are the main source for information for industrial inquiries. For designing questionnaires with appropriate terms, it is desirable therefore, to understand the links between the concepts used in business accounting and business statistics (or in national accounts), mainly for two reasons, namely:

(a) Terms used in the questionnaires must be familiar to business accountants; and

(b) Understanding of business accounting is essential for conversion of the data collected from businesses records into economic data that can be used in business statistics and national accounts (for details see UN 2000)[1].

4.3 In business statistics, the recording of costs of production must cover all costs of goods and services used in production during an accounting period. In business accounting these costs may be reported in different segments of the accounts depending on the business accounting tradition of the country. While in some countries income and costs are recorded together for others these are recorded in three different segments: (i) production, (ii) general administration (enterprise overhead, advertising, distribution, etc.) and (iii) other incomes and other expenses. Also it is important to know that most of the time, other operating revenues which represent secondary incomes such as rental of buildings, charges for miscellaneous services which are recorded in business statistics as output and intermediate consumption, are recorded on net basis (i.e. income receivable less costs incurred) in business accounting.

[1] *Links between Business Accounting and National Accounting*, Studies in Methods, Series F, No. 76, United Nations, 2000

1. *Differences in terminology*

4.4 Terminology used in business accounting may vary greatly from one country to another. For example, while the word "turnover" means total sales in the UK and many European countries, for OECD[2] "turnover" means the sum of gross sales plus some other incomes but excluding revenues from rental of real estate, contributions and gifts, etc.. However, in the Generally Accepted Accounting Principles (GAAP) of the United States, "turnover" is the number of times an asset is replaced during a financial period; often used in the context of inventory turnover or accounts receivable turnover. In securities, for either a portfolio or exchange, turnover is the number of shares traded for a period as a percentage of the total shares.

4.5 Another example of differences in terminology is the term "operating expense". In the UK, operating expense is limited to costs that vary strictly with the quantity produced such as raw materials and purchased components. In the United States and Canada however, operating expense refers to non-manufacturing, non-inventoriable cost such as selling, advertising, and administrative expenses. This means that manufacturing costs are not operating expenses.

2. *Differences in business accounting rules*

4.6 Business accounting principles may be the same in many countries but accounting rules vary from one country to another. These rules affect the adjustment required to be made to the data collected from business accounts in order to use them for the purpose of basic economic statistics. For example:

(a) Some countries' rules require accountants to expense expenditures on software (developed in-house or purchased) while others allow capitalisation of the same. In countries where capitalisation is not allowed, the expenses need to be imputed as output which are then treated as gross capital formation.

(b) In business accounting in most countries, net assets are valued as the sum of the historical value of gross capital formation less depreciation (based on historical value). Therefore, one cannot derive gross capital formation by deducting values of assets in two adjacent periods because assets in business statistics are to be valued at replacement costs in terms of economic accounting standards.

[2] Compilation Manual for an Index of Service Production, OECD, 2007 available from http://www.oecd.org/findDocument/0,2350,en_2649_34257_1_119669_1_1_1,00.html

## B. List of data items

## 1. Demography

### 1(a). Characteristics of Statistical units

| Item No. | | Items |
|---|---|---|
| 1.1 | | Identification code |
| 1.2 | | Location |
| 1.3 | | Period of operation |
| 1.4 | | Type of economic organisation |
| 1.4.1 | | Single-establishment enterprise |
| 1.4.2 | | Multi-establishment enterprise |
| 1.4.2.1 | | Number of establishments in the multi-establishment enterprise |
| 1.5 | | Type of legal organisation and ownership |
| 1.5.1 | | Incorporated enterprises except limited liability partnerships and cooperatives |
| 1.5.1.1 | | Public ownership |
| 1.5.1.1.1 | | By central government |
| 1.5.1.1.2 | | By state government |
| 1.5.1.1.3 | | By local government |
| 1.5.1.2 | | National private |
| 1.5.1.3 | | Foreign controlled |
| 1.5.2 | | Co-operatives and limited liability partnerships |
| 1.5.2.1 | | Public ownership |
| 1.5.2.1.1 | | By central government |
| 1.5.2.1.2 | | By state government |
| 1.5.2.1.3 | | By local government |
| 1.5.2.2 | | National private |
| 1.5.2.3 | | Foreign controlled |
| 1.5.3 | | Non-profit institutions |
| 1.5.3.1 | | Public ownership |
| 1.5.3.1.1 | | By central government |
| 1.5.3.1.2 | | By state government |
| 1.5.3.1.3 | | By local government |
| 1.5.3.2 | | National private |
| 1.5.3.3 | | Foreign controlled |
| 1.5.4 | | Unincorporated enterprises<br>Of which: |
| 1.5.4.1 | | Informal sector enterprises |
| 1.6 | * | Size |
| 1.7 | | Kind-of-activity |
| 1.8 | | Type of unit |
| 1.8.1 | | Principal producing unit |
| 1.8.2 | | Ancillary unit |

### 1. (b) Number of Statistical units

| Item No. | | Items |
|---|---|---|
| 1.10 | * | Number of enterprises |
| 1.10.1 | * | Multi-establishment enterprises |
| 1.10.1.1 | * | Number of establishments |
| 1.10.2 | * | Single establishment enterprises |

# 2. Employment

## 2. (a) Number of persons employed

| Item No. | | Items | Male | Female | Total |
|---|---|---|---|---|---|
| 2.1 | * | Total number of persons employed<br>Of which: | | | |
| 2.1.1 | | Working proprietors | | | |
| 2.1.2 | | Unpaid family workers | | | |
| 2.1.3 | | Employees<br>Of which: | | | |
| 2.1.3.1 | | Production workers<br>Of which | | | |
| 2.1.3.1.1 | | Employees engaged in research and development | | | |
| 2.1.3.1.2 | | Employees engaged in mineral exploration and evaluation | | | |
| 2.1.3.1.3 | | Employees engaged in software & database development | | | |
| 2.1.3.1.4 | | Employees engaged in production of artistic originals | | | |
| 2.1.3.1.5 | | Employees engaged in own account fixed asset formation and major repair | | | |
| 2.1.3.2 | | Other employees | | | |
| 2.2 | | Number of leased employees | | | |
| 2.3 | * | Total number of persons employed in the informal sector | | | |
| 2.3.1 | | Employees in the informal sector | | | |
| 2.3.2 | | Other persons employed in informal sector | | | |

## 2. (b) Average number of persons employed

| Item No. | | Items | Male | Female | Total |
|---|---|---|---|---|---|
| 2.4 | | Average number of persons employed<br>Of which: | | | |
| 2.4.1 | | Employees | | | |
| 2.4.1.1 | | Production workers | | | |
| 2.4.1.2 | | Other employees | | | |

## 2. (c) Hours worked

| Item No. | | Items | Male | Female | Total |
|---|---|---|---|---|---|
| 2.5 | | Hours worked by employees<br>Of which: | | | |
| 2.5.1 | | Hours worked by production workers<br>Of which | | | |
| 2.5.1.1 | | Employees engaged in research and development | | | |
| 2.5.1.2 | | Employees engaged in mineral exploration and evaluation | | | |
| 2.5.1.3 | | Employees engaged in software & database development | | | |
| 2.5.1.4 | | Employees engaged in production of artistic originals | | | |
| 2.5.1.5 | | Employees engaged in own account fixed asset formation and major repair | | | |
| 2.5.2 | | Hours worked by other employees | | | |
| 2.6 | | Hours worked by leased employees | | | |

# 3. Compensation of employees

## 3. Compensation of employees

| Item No. | | Items |
|---|---|---|
| 3.1 | | Wages and salaries in cash and in kind of employees<br>Of which: |
| 3.1.1 | | Production workers<br>Of which |
| 3.1.1.1 | | Employees engaged in research and development |
| 3.1.1.2 | | Employees engaged in mineral exploration and evaluation |
| 3.1.1.3 | | Employees engaged in software & database development |
| 3.1.1.4 | | Employees engaged in production of artistic originals |
| 3.1.1.5 | | Employees engaged in own account fixed asset formation and major construction |
| 3.1.2 | | Other employees |
| 3.2 | | Payments to directors of incorporated enterprises for their attending meetings |
| 3.3 | | Social insurance contributions payable by employers |

# 4. Other expenditures

## 4. (a) Purchases of goods and services

| Item No. | | Items |
|---|---|---|
| 4.1 | | Cost of raw materials and supplies except gas, fuels and electricity<br>Of which: |
| 4.1.1 | | Purchases or receipts of raw materials and supplies from other enterprises |
| 4.1.2 | | Value of raw materials and supplies delivered by other establishments of the same enterprise |
| 4.1.3 | | Cost of materials for own-account capital formation<br>Of which: |
| 4.1.3.1 | | for research and development |
| 4.1.3.2 | | for mineral exploration and evaluation |
| 4.1.3.3 | | for software & database development |
| 4.1.3.4 | | for production of artistic originals |
| 4.1.3.5 | | for own account fixed asset formation and major repair |
| 4.2 | | Cost of gas, fuel and electricity purchased |
| 4.2.1 | | Cost of individual fuels and gas purchased |
| 4.2.2 | | Cost of electricity purchased |
| 4.3 | | Cost of water and sewerage services |
| 4.3.1 | | Cost of water purchased |
| 4.3.2 | | Cost of wastewater services purchased |
| 4.3.3 | | Cost of sewerage services purchased |
| 4.4 | | Purchases of services except rental |
| 4.4.1 | | Cost of industrial services purchased and also delivered by other establishments of the same enterprise<br>Of which: |
| 4.4.1.1 | | Maintenance, repair and installation (except construction) services |
| 4.4.1.2 | | Contract and commission work |
| 4.4.1.2.1 | | Fees paid for leased employment |
| 4.4.2 | | Cost of non-industrial services purchased and also delivered by other establishments of the same enterprise |
| 4.4.2.1 | | Maintenance and repair of buildings and structures |
| 4.4.2.2 | | Communication services |
| 4.4.2.3 | | Transport services |

| Item No. | | Items |
|---|---|---|
| 4.4.2.4 | | Advertising and promotional services |
| 4.4.2.5 | | Financial services (excluding interest payments) |
| 4.4.2.9 | | Other non-industrial services |
| 4.5 | | Purchases of goods and services for resale in the same conditions as received |
| 4.6 | | Rental payments |
| 4.6.1 | | Rental payments for machinery and equipments |
| 4.6.2 | | Rental payments for dwellings and structures |
| 4.7 | | Non-life insurance premiums payable on establishment property |

### 4. (b) Data items on quantity

| Item No. | | Items |
|---|---|---|
| Q4.1 | | Quantity of individually important materials and supplies |
| Q4.2 | | Quantity of individual fuels and gas purchased |
| Q4.2.1 | | Quantity of electricity purchased |
| Q4.2.2 | | Quantity of electricity generated |
| Q4.2.3 | | Quantity of electricity sold |
| Q4.2.4 | | Total energy consumed (tera joules) |
| Q4.3.1 | | Quantity of water purchased |
| Q4.3.1.1 | | Quantity of water abstracted for own use |
| Q4.3.1.2 | | Quantity of water sold |
| Q4.3.1.3 | | Total water used (cubic maters) |
| Q4.3.2 | | Quantity of wastewater treated on site prior to discharge |
| Q4.3.3 | | Quantity of wastewater discharged without treatment |

## 5. Value of shipments, receipts for services and other revenues

### 5. (a) Turnover, sales, shipments, receipts for services and other revenues

| Item No. | | Items |
|---|---|---|
| 5.1 | | Value of shipments/sales/turnover, including transfers to other establishments of the same enterprise |
| 5.1.1 | | Value of shipments/sales/turnover of goods produced by the establishment |
| 5.1.1.1 | | Value of shipments/sales/turnover of goods produced to other enterprises |
| 5.1.1.2 | | Transfers of goods produced to other establishments of the same enterprise |
| 5.1.1.3 | | Exported to customers and affiliated foreign branches |
| 5.1.2 | | Value of shipments/sales/turnover of all goods and services purchased for resale in the same condition as received |
| 5.1.4 | | Receipts for industrial work done or industrial services rendered to others<br>Of which: |
| 5.1.4.1 | | Contract and commission work |
| 5.1.4.1.1 | | From units not resident in the country |
| 5.1.4.2 | | Maintenance, repair and installation (except construction) services<br>Of which |
| 5.1.4.2.1 | | Installation work |
| 5.1.4.3 | | Research and development work of an industrial nature |
| 5.1.4.4 | | Industrial services rendered to other enterprises |
| 5.1.4.5 | | Industrial services rendered to other establishments of the same enterprise |
| 5.2 | | Other revenues |
| 5.2.1 | | Revenue from the rental or lease of machinery and equipment |
| 5.2.2 | | Revenue from the rental or lease of buildings |

| | | |
|---|---|---|
| 5.2.3 | | Other revenues n.e.c. |
| 5.3 | * | Value of own-account fixed assets |

### 5. (b) E-commerce

| Item No. | | Items |
|---|---|---|
| 5.4 | | E-commerce sale/turnover/value of shipments/receipts for services or other revenues |

### 5. (c) Data items on quantity

| Item No. | | Items |
|---|---|---|
| Q5.1 | | Quantity and value of individually important products |

## 6. Inventories

### 6. Inventories

| Item No. | | Items |
|---|---|---|
| 6.1 | * | Total inventories |
| 6.1.1 | | At the beginning of the period |
| 6.1.2 | | At the end of' the period |
| 6.1.3 | * | Change (plus or minus) |
| 6.2 | | Inventories of materials, fuels and supplies |
| 6.2.1 | | At the beginning of the period |
| 6.2.2 | | At the end of the period |
| 6.2.3 | * | Change (plus or minus) |
| 6.3 | | Work-in-progress |
| 6.3.1 | | At the beginning of the period |
| 6.3.2 | | At the end of the period |
| 6.3.3 | * | Change (plus or minus) |
| 6.4 | | Inventories of finished goods |
| 6.4.1 | | At the beginning of the period |
| 6.4.2 | | At the end of the period |
| 6.4.3 | * | Change (plus or minus) |
| 6.5 | | Inventories of goods purchased for resale in the same condition as received |
| 6.5.1 | | At the beginning of the period |
| 6.5.2. | | At the end of the period |
| 6.5.3 | * | Change (plus or minus) |

## 7. Taxes and subsidies

### 7. Other taxes and subsidies on production

| Item No. | | Item No. |
|---|---|---|
| 7.1 | | Taxes |
| 7.1.1 | | Other taxes on production |
| 7.2 | | Subsidies received |
| 7.2.1 | | Subsidies on products |
| 7.2.2 | | Other subsidies on production |

## 8. Output

### 8. Output

| Item No. | | Items |
|---|---|---|
| 8.1 | * | Gross output at basic prices |
| 8.2 | ** | Census output at basic prices |

## 9. Intermediate consumption and census input

### 9. Intermediate consumption and census input

| Item No. | | Items |
|---|---|---|
| 9.1 | * | Intermediate consumption at purchasers' prices |
| 9.2 | ** | Census input at purchasers' prices |

## 10. Value added

### 10. Total value added and census value added

| Item No. | | Items |
|---|---|---|
| 10.1 | * | Total value added at basic prices |
| 10.2 | ** | Census value added at basic prices |

## 11. Gross Fixed Capital formation

### 11. Assets, capital expenditures, retirements and depreciation

| Item No. | | Items |
|---|---|---|
| 11.1 | | Gross value of fixed assets (at acquisition cost) at the beginning of the period |
| 11.1.1 | | Dwellings |
| 11.1.2 | | Other buildings and structures |
| 11.1.3 | | Machinery and equipment |
| 11.1.3.1 | | Transport equipment |
| 11.1.3.2 | | ICT equipment |
| 11.1.3.3 | | Other machinery and equipment |
| 11.1.4 | | Intellectual property products |
| 11.1.4.1 | | Research and development |
| 11.1.4.2 | | Mineral exploration and evaluation |
| 11.1.4.3 | | Computer software and databases |
| 11.1.4.4 | | Entertainment, literary and artistic originals |
| 11.1.4.5 | | Other |
| 11.2 | | Capital expenditure on new and used fixed assets (acquisitions) during the period |
| 11.2.1 | | Dwellings |
| 11.2.2 | | Other buildings and structures |
| 11.2.3 | | Machinery and equipment |
| 11.2.3.1 | | Transport equipment |
| 11.2.3.2 | | ICT equipment |
| 11.2.3.3 | | Other machinery and equipment |
| 11.2.4 | | Intellectual property products |
| 11.1.4.1 | | Research and development |
| 11.1.4.2 | | Mineral exploration and evaluation |

| Item No. | | Items |
|---|---|---|
| 11.1.4.3 | | Computer software and databases |
| 11.2.4.4 | | Entertainment, literary and artistic originals |
| 11.2.4.5 | | Other |
| 11.3 | | Gross value of fixed assets sold, retired and scrapped (disposal) during the period |
| 11.3.1 | | Dwellings |
| 11.3.2 | | Other buildings and structures |
| 11.3.3 | | Machinery and equipment |
| 11.3.3.1 | | Transport equipment |
| 11.3.3.2 | | ICT equipment |
| 11.3.3.3 | | Other machinery and equipment |
| 11.3.4 | | Intellectual property products |
| 11.1.4.1 | | Research and development |
| 11.1.4.2 | | Mineral exploration and evaluation |
| 11.1.4.3 | | Computer software and databases |
| 11.3.4.4 | | Entertainment, literary and artistic originals |
| 11.3.4.5 | | Other |
| 11.4 | | Depreciation |
| 11.4.1 | | Dwellings |
| 11.4.2 | | Other buildings and structures |
| 11.4.3 | | Machinery and equipment |
| 11.4.3.1 | | Transport equipment |
| 11.4.3.2 | | ICT equipment |
| 11.4.3.3 | | Other machinery and equipment |
| 11.4.4 | | Intellectual property products |
| 11.1.4.1 | | Research and development |
| 11.1.4.2 | | Mineral exploration and evaluation |
| 11.1.4.3 | | Computer software and databases |
| 11.4.4.4 | | Entertainment, literary and artistic originals |
| 11.4.4.5 | | Other |
| 11.5 | * | Gross value of fixed stock at the end of the period |
| 11.5.1 | * | Dwellings |
| 11.5.2 | * | Other buildings and structures |
| 11.5.3 | * | Machinery and equipment |
| 11.5.3.1 | | Transport equipment |
| 11.5.3.2 | | ICT equipment |
| 11.5.3.3 | | Other machinery and equipment |
| 11.5.4 | * | Intellectual property products |
| 11.1.4.1 | | Research and development |
| 11.1.4.2 | | Mineral exploration and evaluation |
| 11.1.4.3 | | Computer software and databases |
| 11.5.4.4 | | Entertainment, literary and artistic originals |
| 11.5.4.5 | | Other |

## 12. Orders

### 12. Orders

| Item No. | | Items |
|---|---|---|
| 12.1 | | New orders received |
| 12.2 | | Unfilled orders at the end of the inquiry period |

## 13. Environmental protection

### 13. Environmental protection expenditures

| Item No. | | Item |
|---|---|---|
| 13.1 | | Environmental protection expenditures |

* This item will often be derived by the statistical office from other items of collected data, although in some cases countries may prefer to include the item on the questionnaire, for example, to verify the accuracy of other figures supplied.

** Measurements of 'census output', 'census intermediate consumption' and 'census value added' are not part of the present recommendations, only when countries would like to maintain their time series on these aggregates, they could opt for continuing their measurements.

**Note:** The capital formation of each component of intellectual property products comprise two components, (a) those that are investment goods acquired from other enterprises and (b) those that are developed on own-account or for own use. The latter can only approximated by cost of production which is equal to the sum of material and supplies costs, compensation of employees, other taxes on production, depreciation of the fixed assets used in production, and an imputed margin for overhead costs and profits if possible. The estimate of the gross output (item 8.1) has to be adjusted by the national statistical office by the imputed value of the own-account capital formation to the extent of the cost of material and supplies used for the production of the intellectual property products.

## Definitions of data items

## 1. Demography

### 1 (a) Characteristics of Statistical units

4.7 Statistical units engaged in industrial activities may be distinguished and classified following different criteria and variables. In addition to the financial and production data, each statistical survey aims at collecting detailed information associated with the statistical unit itself and asks for its location, period of operation, type of ownership and economic organisation, kind-of-activity, size etc.

4.8 Most of the items included in this heading are generally set forth for purposes of cross tabulation of the data. It should be noted that, in the case of multi-establishment enterprises, some of these items refer more appropriately to the enterprise of which the unit under reference is a component and, depending on how this problem is handled in the operational design of the survey, may be collected at the enterprise level for subsequent allocation to the statistical units supporting it.

4.9 Most of the data items characterizing the statistical units are already explained in Chapter III, *"Characteristics of statistical units"*. Depending on the design and purpose of statistical surveys these items may be collected at both the enterprise or establishment level.

***Period of operation (item 1.3)***

4.10 This indicates the period during which the establishment has been in operation during the reference period. It would be useful to seek information under the following alternative items (a) in operation since (date), (b) temporarily or seasonally inactive, (c) ceased operation (date), and (d) sold or leased to another operator (name of new operator). Besides the information that this characteristic provides about the activity status of the unit (active or temporarily inactive), it also helps in interpreting the returns made by statistical units that are affected by seasonal factors and those made by statistical units that began or ceased operations during the reference period.

***Informal sector enterprises (item 1.5.4.1)***

4.11 For the purpose of the present recommendations the industrial production units of the informal sector (item 1.5.4.1) are defined according to the 15th International Conference of Labour Statisticians resolution (ILO 1993b) as a subset of unincorporated enterprises owned by households, i.e. as a subset of production units which are not constituted as separate legal entities independently of the households or household members who own them, and for which no complete sets of accounts (including balance sheets of assets and liabilities) are available which would permit a clear distinction of the production activities of the enterprises from the other activities of their owners and the identification of any flows of income and capital between the enterprises and the owners.

**1 (b) Number of statistical units**

***Number of enterprises (item 1.10)***

4.12 This indicator is defined as a count of the number of active enterprises operating in industrial activities during the period under reference. Dormant (non-active) units should be excluded. This statistic should include all units active during at least a part of the reference period. The population of units for the present recommendations is defined as all units which are primarily engaged in industrial activities, i.e. those falling under section B (mining and quarrying), section C (manufacturing), section D (Electricity, gas, steam and air conditioning supply) and section E (water supply; sewerage, waste management and remediation activities of ISIC Rev.4.

4.13 Because of the variation in size and organisational structure of enterprises, this item is further subdivided into two broad categories of enterprises:

(a) Complex enterprises (item 1.10.1). A complex enterprise, also called a multi-establishment enterprise, is one consisting of more than one establishment. Individual establishments of a complex enterprise may generally be engaged in different economic activities belonging to different ISIC Rev. 4 classes but they may engage in the same activity as well, and

*(b)* Single-establishment enterprises (item 1.10.2). Conversely, a single-establishment enterprise is one with a single establishment.

***Number of establishments (item 1.10.1.1)***

4.14 It is a count of the number of establishments operating in the economy during the period under reference. Establishments must be included even if they have no paid employees. This statistic should include all establishments active for at least a part of the reference period. In the case of most small and medium-sized businesses, the number of enterprises and the number of establishments is same. Therefore, the total number of establishments is equal to the sum of the number of establishments in multi-establishment enterprises (item 1.10.1.1) and the number of single establishment enterprises (item 1.10.2)

4.15 There are alternative ways of counting the number of establishments, but the most meaningful figure, when all the data obtained from a business inquiry are published together, is clearly the total number of active establishments to which the data relate (i.e. total population in operation). Other alternatives, which may be of some interest, are:

(a) The number of establishments making usable returns;

(b) The number of both active and inactive establishments in existence at any time (or at a particular date) in the inquiry period and falling within the scope and coverage of the inquiry.

4.16 Where small and micro establishments are enumerated on a sample basis, data on the total population of such active establishments should be reported by grossing up (with the sampling fraction) the number of establishments included in the sample.

## 2. Employment[3]

### 2 (a). Number of persons employed

4.17 There are many ways of dealing with the question of the time period for which employment should be counted. The enumeration may refer to a specified day, pay period or calendar week in the inquiry period. It might be useful to select a period that would coincide with that used for other statistical inquiries into employment and earnings. In selecting a period, consideration may need to be given to seasonal factors. In addition it is suggested that limited data on average employment over the whole of the reporting period be obtained.

4.18 Data should also be collected for a number of categories of worker, as specified below, with a breakdown by gender in each category as resources permit. Other

[3] For status in employment refer to ILO (1993a)

characteristics might also be of national interest, such as a distinction between part-time, full-time and seasonal workers, between adults and juveniles based on the laws and customs of the country and the nationality composition. Some countries, more specifically those without infra-annual surveys, may wish to capture seasonal factors by requesting, say total employment for each quarter or even each month of the reporting period.

***Total number of persons employed (item 2.1)***

4.19 The number of persons employed is defined as the total number of persons who work in or for the statistical unit, whether full-time or part time, including:

- working proprietors;
- active business partners;
- unpaid family workers;
- persons working outside the unit who belong to it (e.g. sales representatives, delivery personnel, repair and maintenance teams) provided that they receive a regular salary from that unit;
- salaried managers and salaried directors of incorporated enterprises;
- persons on short-term leave (sick leave, annual leave or vacation);
- persons on special paid leave (educational or training leave, maternity or parental leave);
- persons on strike;
- part-time workers on the payroll;
- seasonal workers on the payroll;
- apprentices on the payroll;
- outworkers on the payroll, paid for the work done.

4.20 Total number of persons employed excludes:

- directors of incorporated enterprises and members of shareholders' committees who are paid solely for their attendance at meetings;

- labour made available to the unit by other units and charged for (contract workers, paid through contractor, persons carrying out repair and maintenance work in the unit on behalf of other units);

- persons on indefinite leave;

- persons on military leave;

- persons on pension;

- outworkers paid by subcontractors (amount paid to sub-contractors in respect of outworkers are treated as cost on services purchased – item 4.4.1.2)..

***Working proprietors (item 2.1.1)***

4.21 This includes all individual proprietors and partners actively engaged in the work of the establishment, excluding silent or inactive partners whose principal activity is outside of the establishment. This category is not applicable to any incorporated or similar enterprise the ownership of which is represented by holding of equity shares.

***Unpaid family workers (item 2.1.2)***

4.22 Unpaid family workers are defined as all persons living in the household of the proprietor(s) of the owning enterprise and working in or for the establishment, irrespective of the number of hours worked during the reference period, without regular pay (that is, without an agreed amount to be paid for work done). Where it is customary for young persons, in particular, to work without pay in an economic enterprise operated by a related person who does not live in the same household, the requirement of 'living in the same household' may be eliminated. Family workers who receive pay for work performed should be classified as employees.

4.23 It should be noted that countries which prefer for special reasons to set a minimum time criterion for the inclusion of unpaid family workers among the employed should identify and separately classify those who worked less than the prescribed time.

***Employees (items 2.1.3)***

4.24 This category includes all persons who work in or for the establishment, who have a contract of employment with the unit and receive compensation in cash or in kind at regular intervals of time. The relationship of employer to employee exists when there is a written or oral agreement, which may be formal or informal, between the establishment and a person, normally entered into voluntarily by both parties, whereby the person works for the unit in return for remuneration in cash or in kind. The remuneration is normally based on either the time spent at work or some other objective indicator of the amount of work done. Compensation could be in a form of wages, salaries, fees, gratuities, piecework pay or remuneration in kind (item 3.1).

4.25 The category "employees" is intended to include all persons engaged in the economic activity of the establishment other than working proprietors and unpaid family workers. It includes outworkers when paid by and under the control of the concerned unit. Employees in activity ancillary to the main activity of the unit are also included. Working proprietors and unpaid workers are not treated as employees.

4.26 The employee data should distinguish between production workers and other employees. The object of the subdivision, which is frequently required for productivity studies and in labour negotiations, is to identify those employees most directly associated with the productive, as opposed to the overhead, activities of the unit. The precision with which this distinction can be made depends on the nature of the employment and pay-roll records available for most establishments - that is, the detail of these records and their similarity from one unit to another.

4.27 The distinction between production worker and other employees, which has traditionally been used in the recommendations for industrial statistics, was drawn up in the absence of any international standards for determining corresponding categories in labour statistics inquiries. For this reason, it may not be easily assimilated in those countries that have adopted other criteria. Minor deviations in this respect should not unduly affect international comparability.

4.28 It is recognised that there are several categories in which production workers engaged in industrial activities may be classified. For the purpose of present publication however, it is recommended to collect information on the number and wages and salaries paid to production workers engaged in the production of intellectual property products (namely, research and development; mineral exploration and evaluation; software and databases development; entertainment, literary and artistic originals) only because this information is useful for estimating (on cost basis) the value of own-account production of these activities which is recognised as an asset (classified as intellectual property products) in the 1993 SNA Rev. 1.

***Production workers (item 2.1.3.1)***

4.29 This item is defined as all employees who are directly engaged in the production or related activities of the establishment, including any clerical or working supervisory personnel whose function is to record or expedite any step in the production process. Employees of a similar type engaged in activities ancillary to the main activity of the establishment should also be considered production worker.

4.30 Some countries may wish to include special characteristics of production workers. If so, it is important to limit the categories to those that can be defined precisely and clearly in terms of the usually available employment records. Of particular interest, are the following:

(a) The degree of labour qualification - skilled, semi-skilled, unskilled, apprentice and the like;

(b) The specific functional category - for example, personnel wholly engaged in own-account construction work, fabrication personnel, processing and assembly personnel, transportation and warehousing personnel, repair and maintenance personnel;

(c) Whether employed full-time or part-time;

***Other employees (item 2.1.3.2)***

4.31 This item is defined as all employees other than those considered as production workers. Where the definition given in the above paragraph is followed, this category will include administrative, technical and clerical personnel such as salaried managers and directors, clerks, typists, bookkeepers, administrative supervisors, sales persons and the like.

4.32 Countries may wish to establish additional breakdowns for the various groups of employees that exist in their economies, and for which it is important and possible to produce separate statistics. One such breakdown might be established with reference to the length of work as set in the existing working time arrangements[4]. Working time arrangements relate to those arrangements as stipulated in laws and regulations, collective agreements, arbitral awards or employment contracts or as determined by rules or customs of establishments or community, or by the individual self-employed person on the basis of contractual obligations, work requirements or personal and household preferences.

4.33 In a given country the normal length of work may vary for different groups of paid employment jobs, depending on the different working time arrangements. Normal length of work are the hours that persons in paid employment jobs spend on work activities during a reference period, as specified in laws and regulations, collective agreements or arbitral awards. Individual working time arrangements of persons in paid employment jobs might differ from this norm in terms of shorter/longer daily or weekly hours of work, or fewer or more days per week than the norm; or part-year work.

4.34 It might be useful to provide separate statistics about employees whose working time is equal to the normal working hours – full-time employees, or about employees whose working time deviates from the normal working hours – part-time employees. Due to differing conventions in the definition of normal hours of work across countries it is impossible to establish an exact international distinction between part-time and full-time employees. However, it is recommended, as resources permit, that the item 'Total number of employees' (Item 2.1.3) be presented into the following three categories: full-

[4] See the Resolution concerning statistics of hours of work, adopted by the Tenth International Conference of Labour Statisticians (October 1962), http://www.ilo.org/public/english/bureau/stat/res/index.htm

time employees; part-time employees; and employees in fill-time equivalence. All three categories should be calculated by reference to the number of hours worked (item 2.5).

***Number of full-time employees (part of item 2.1.3)***

4.35 Full time employees are persons whose working time is equal to the standard working time for a full week, month or year. Standard (or normal) working time are the hours that persons in paid employment jobs spend on work activities during a reference period, as specified in laws and regulations, collective agreements or arbitral awards.

***Number of part-time employees (part of item 2.1.3)***

4.36 Part-time employees are persons whose working time hours are less than the standard working time of a full-time employee. This category encompasses all forms of part-time work (half-day work, work for one, two or three days a week, etc.). Part-time employees and intermittent/seasonal employees (who may work full time but for a fixed short period, e.g. temporary workers, film crew, etc.) should not be confused.

***Employees in full-time equivalents (part of item 2.1.3)***

4.37 Based on the total number of hours worked by all part-time employees, their number could be converted into full-time equivalents. The conversion should be carried out with regard to the standard working time of a full-time employee in the unit by taking into account the number of hours, days, weeks or months worked. Full-time equivalent is defined as total hours worked in a unit divided by average (annual, quarterly, monthly or weekly) hours worked by a full-time employee. That conversion will facilitate international comparisons with countries which can only estimate full-time equivalent employment. Due to the differences in the length of the full-time employment by activities, employees' categories etc. it is recommended calculating the conversion at the detail level possible.

***Outworkers on the pay-roll (part of item 2.1.3)***

4.38 Countries may find it useful to provide statistics on other aspects of employment arrangements in the industrial sector, such as place of work or employment. An outworker is a person who agrees to work for a particular enterprise or to supply a certain quantity of goods or services to a particular enterprise, by prior arrangement or contract with that enterprise, but whose place of work is not within any of the establishments that make up that enterprise. Only those outworkers are included here who are remunerated directly, or indirectly, on the basis of the amount of work done, that is, by the amount of labour that is contributed as an input into some process of production, irrespective of the value of the output produced or the profitability of the production process. With the advent on new technologies and internet etc. information on this type of employment in the manufacturing sector may be of importance.

4.39 Some outworkers may purchase their own equipment or materials, or both for production of goods or services to be supplied to other enterprises. The income received by the outworker in this case is a function of the value of the outputs produced by him/her from some process of production for which he/she is responsible. This kind of remuneration implies that the worker is self-employed.

4.40 Outworkers paid by subcontractors are not included; the amounts paid to subcontractors in respect of outworkers are treated as "cost of industrial services purchased" (item 4.4.1.2.1).

4.41 Outworkers on the pay-roll should be enumerated for a single period. Where the numbers are significant and fluctuate, it may also be useful to collect the average number in the inquiry periods as defined for employees.

***Employees engaged in research and development (item 2.1.3.1.1)***

4.42 The present recommendations adopt the definition of research and development as given in the *Frascati Manual* (OECD 2002b) which defines it as - "Research and experimental development comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications". Most of research and development is undertaken on own-account, therefore the research and development output and capital formation should be estimated by summing up the cost of inputs, including labour inputs.

4.43 Persons employed in research and development comprise all persons employed directly on research and development, as well as those providing direct services such as research and development managers, administrators and clerical staff. Those persons providing an indirect service, such as canteen and security staff, should be excluded, even though their wages and salaries are included as an overhead in the measurement of expenditure. The research and development personnel must be distinguished from personnel for a wide range of related activities. The following are therefore excluded from research and development personnel:

- personnel employed on education and training,
- personnel employed on other scientific and technological activities (e.g. information services, testing and standardisation, feasibility studies, etc.),
- personnel employed on other industrial activities (e.g. industrial innovations n.e.c.),
- personnel employed on administration and other indirect supporting activities.

***Employees engaged in mineral exploration and evaluation (item 2.1.3.1.2)***

4.44 This comprises the total number of employees working on exploration for petroleum and natural gas and for non-petroleum deposits that may be exploited

commercially and subsequent evaluation of the discoveries made. The mineral exploration and evaluation is recognized as an asset in the 1993 SNA, Rev.1. When produced on own-account it represents the cost of production and should be estimated by summing up the cost of inputs, including labour inputs.

***Employees engaged in software and databases development (item 2.1.3.1.1)***

4.45 This item comprises the total number of persons employed working on development of software and databases with an expected working life of more than one year, as well as those providing direct services such as managers, administrators and clerical staff. Those persons providing an indirect service, such as canteen and security staff, should be excluded, even though their wages and salaries are included as an overhead in the measurement of expenditure. The development of software and databases is recognized as an asset in the 1993 SNA, Rev.1. When produced on own-account it represents the cost of production and should be estimated by summing up the cost of inputs, including labour inputs.

***Employees engaged in production of Entertainment, literary and artistic originals (item 2.1.3.1.4)***

4.46 This comprises the total number of employees working in the production of entertainment, literary and artistic originals. Entertainment, literary and artistic originals are considered as an asset and consist of the original films, sound recordings, manuscripts, tapes, models, etc., on which drama performances, radio and television programming, musical performances, sporting events, literary and artistic output, etc., are recorded or embodied. When produced on own-account it represents the cost of production and should be estimated by summing up the cost of inputs, including labour inputs.

***Employees engaged in own account fixed asset formation and major repair (item 2.1.3.1.5)***

4.47 The item comprises the total number of employees engaged in the own-account fixed assets formation and major repairs. Fixed assets formation and major repair when undertaken on own-account is considered as capitalized production that is retained by their producers as investment. Capitalized production is unsold production therefore; it is valued at production costs, i.e., by summing up the cost of inputs, including labour inputs.

***Leased employment (item 2.2)***

4.48 Leased employment entails the provision of human resources for client businesses for a fee. Leasing companies operate in a co-employment relationship with client businesses and are specialized in providing wide range of human resource services. This item comprises the total number of persons supplied by employment agencies or similar organisations to the industrial establishments. Employment agencies of this kind do not

supervise the employees who are under the control (direction and supervision) of the clients of employment agencies. Leased employees are on the payroll of the employment agency and not on the payroll of the establishment paying the fee. This provision of human resources is typically done on short-term basis (the unit providing the leased employees will be classified in ISIC, Rev.4 class 7820) or on a long-term and permanent basis (the unit providing the leased employees will be classified in ISIC, Rev.4 class 7830). The information on leased employment is useful for the meaningful productivity analysis of the industrial production units which actually use the labour inputs of the leased employees. The following are excluded from the leased employment:

(a) Temporary staffing obtained from a staffing service

(b) Contractors, subcontractors or independent contractors,

(c) Purchased or managed services, such as janitorial, guard, or landscape services,

(d) Professional or technical services purchased from another firm, such as software consulting, computer programming, engineering, or accounting services.

4.49 The compensation of employees paid to the leased employees can not be furnished by the establishment as they are not on its payroll. As an approximation to the compensation of employees, the fees paid by the establishment to the employment agencies in lieu of their services should be collected (item 4.4.1.2.1). Number of hours worked by leased employees is important indicator for labour analysis.

***Number of persons engaged in informal sector (item 2.3)***

4.50 Total number of persons employed in the informal sector is defined as comprising all persons who, during a given reference period, were employed in at least one production unit of the informal sector (item 1.5.4.1), irrespective of their status in employment but only if this is their main job. The total number of persons employed in the informal sector must refer to the whole territory of the country. This item can be further disaggregated into employees (item 2.3.1) and other persons employed (item 2.3.2) in the informal sector.

4.51 The number of persons employed in the informal sector does not include:

- persons exclusively engaged in the production of goods or services for own final consumption or own fixed capital formation;

- persons engaged in agricultural activities, as these activities are being excluded from the scope of informal sector for practical reasons;

- self-employed persons engaged in rendering the following professional or technical services – doctors, lawyers, accountants, architects, engineers, etc. if they do not fulfil the requirements for the informal sector enterprises;

- paid domestic workers.

4.52 The employment in informal sector could be estimated directly through conduct of informal sector surveys or indirectly, through alternative approaches. One such approach is the residual method, where the employment in informal sector is estimated as the difference between the total employment (based on the population census or labour force survey data) and the formal employment (based on economic census, establishment survey or administrative data sources).

## 2 (b) Average number of persons employed

### *Average number of persons employed (item 2.4)*

4.53 This item is defined as the average number of employees (item 2.4.1) plus the number of working proprietors (item 2.1.1) and unpaid family workers (item 2.1.2) for a single period. This data item serves as the criterion for size distribution of the unit. If the average number of persons employed is not available, the total number of persons employed (item 2.1) in a single period may be used as the size criterion.

### *Average number of employees (item 2.4.1)*

4.54 The average number of employees (and the corresponding averages for production workers and other employees) is the arithmetic average of the number of employees for each calendar day of the reference period including holidays and weekends, divided by the number of days in the reference period. The annual average number of employees is defined as an arithmetic average of monthly (or quarterly) average numbers of employees.

4.55 In some countries, the number included in the category other employees (item 2.4.1.2) remains relatively stable and is therefore, enumerated in one period only. Consequently, the average number of employees is calculated as the average number of production workers in several periods plus the number of other employees for a single period. This alternative concept may be used where the circumstances warrant it

## 2 (c) Hours worked

### *Number of hours worked by employees[5] (item 2.5)*

4.56 Number of hours worked, also known as *Volume of work* or *Labour input* is important indicator used for labour analysis, conversion of part-time employees into full-time equivalents, study of productivity and calculation of a number of aggregates per

[5] See draft International Conference of Labour Statisticians Resolution on Working Time Measurement (http://www.insee.fr/en/nom_def_met/colloques/citygroup/2006_meeting.htm)

hour worked. Number of hours worked by employees is defined as the total number of hours actually spent on activities by them that contribute to the production of goods and services during the reference period. This indicator can be measured per week, per month, or per year. If total hours worked are estimated per year, the indicator will provide the average annual hours worked of all persons in an economy, or the volume of hours worked. It is recommended that it should be broken down similarly to the employment categories.

4.57 Some small units, particularly those with less formal records, may be unable to report hours worked. In this case it is recommended to impute hours worked from the responses to alternative questions such as the number of workers, average number of working days, length of the productive hours in an usual working day etc

4.58 Hours actually worked should include:

(a) *Productive hours.* Hours spent on activities related to persons' employment and intended for production. These activities may be carried out within normal or contractual periods, or as overtime and may be paid or unpaid, regardless of the place where they are carried out, such as the establishment, the home, in the fields, on the street, and include work taken home from the place of work;

(b) *Hours spent on ancillary activities*. Hours spent on activities not directly intended for the production but which are necessary to enable such production. This includes hours spent on:

(i) the design, preparation, cleaning of workplace or work instruments, repairs or maintenance of work processes;

(ii) professional training (for persons in paid employment) authorised and provided directly or indirectly by the employer; travelling or itinerant activities required or paid for and inherent to the employment as in door-to-door vendors, seafarers, drivers, and persons travelling to attend a meeting outside their usual place of employment;

(iii) other job-related personal training or education activities paid (including in kind) by the employer, whether in or outside of the place of employment.

(c) *Unproductive hours spent in the course of work*. Hours spent between productive periods that are unavoidable yet inherent to work processes and during which persons in employment continue to be available for work. Included are hours spent:

(j) waiting for customers in an office, shop, street;

(ii) standing-by for technical or economic reasons such as lack of work supply, machinery breakdown, accident;

(iii) between productive periods during which no work is done but when payment is made under a guaranteed employment contract;

(iv) between productive periods during which no work is done but when payment is made under a guaranteed employment contract;

(v) travel time, as a function of specific work assignments or customers, when the place of employment is variable.

(d) *Short periods of rest*. Periods of less than 30 minutes spent between productive periods on personal activities during which persons are not available to the employer or for other work. Such periods occur as a consequence of natural needs; may be authorised by contract or custom and may include tea, coffee or prayer breaks

4.59 Hours actually worked should exclude:

(a) Hours paid for but not worked, such as paid annual leave, paid public holidays, paid sick leave, paid education leave, paid parental (maternity, paternity) leave, paid leave for family reasons, non-military civilian service;

(b) Meal breaks longer than 30 minutes;

(c) Time spent on commuter travel between home and employment that is not actually time spent working, even if paid by the employer.

4.60 Number of days worked by employees provides a more precise measure of labour employed than does a count of numbers. It is probably easier to obtain from pay-roll records than are hours worked and is included as an alternative concept. Days worked should refer to the total number of days spent at work and not to days paid for, days spent on vacation, casual or sick leave should be excluded. In addition, it would be useful to ascertain the standard number of working hours per day in the establishment for full-time workers and to collect separately the days worked by part-time workers. Provision is made for the subdivision by employment status.

4.61 Some countries calculate days worked as full-time equivalent days by converting part-time and overtime hours into work days on the basis of the standard number of hours worked per day. This is analogous to hours worked, as the results can be calculated in hours, and they should be calculated thus for international comparability.

***Breakdown of employment by gender and occupation***

4.62 In general, separate figures for male and female employment should be sought. Each of the employment categories and corresponding labour input data, as resources permit, should distinguish between male and female.

## 3. Compensation of employees

### 3. *Compensation of employees*

4.63 Compensation of employees is defined as the total remuneration, in cash or in kind, payable by the establishment to an employee in return for work done by the latter during the reference period. It should be recorded on an accrual basis; i.e., it is measured by the value of the remuneration in cash or in kind which an employee becomes entitled to receive from an employer in respect of work done during the relevant period, whether paid in advance, simultaneously or in arrears of the work itself. Compensation of employees does not include any taxes payable by the employer on the wage and salary bill i.e. payroll tax. Compensation of employees has two main components: (a) wages and salaries payable in cash or in kind (item 3.1); and (b) social insurance contributions payable by employers (item 3.3). Employees are those as defined in data item 2.1.3.

4.64 No compensation of employees is payable in respect of unpaid work undertaken voluntarily, including the work done by the non-paid family workers. Payments to working proprietors not in receipt of a regular salary should be excluded.

***Wages and salaries in cash and in kind of employees (item 3.1)***

4.65 Wages and salaries[6] are defined as all payments whether in cash or in kind, made by the employer during the reference period in connection with work done by all persons included in the count of employees regardless of whether they are paid on the basis of working time, output or piecework and whether it is paid regularly or not. Wages and salary include the values of any social contributions, income taxes, etc., payable by the employee even if they are actually withheld by the employer for administrative convenience or other reasons and paid directly to social insurance schemes, tax authorities, etc., on behalf of the employee. Wages and salaries may be paid in various ways, including goods or services provided to employees as remuneration in kind instead of, or in addition to, remuneration in cash.

*Wages and salaries in cash*

4.66 Wages and salaries in cash include the following kinds of remuneration:

[6] For more details on the components of wages and salaries of employees, see Chapter 7. The Distribution of Income Accounts, 1993 SNA Rev. 1

(a) Wages or salaries payable at regular weekly, monthly or other intervals, including payments by results and piecework payments; enhanced payments or special allowances for working overtime, at nights, at weekends or other unsocial hours; allowances for working away from home or in disagreeable or hazardous circumstances; expatriation allowances for working abroad; etc.;

(b) Supplementary allowances payable regularly, such as housing allowances or allowances to cover the costs of travel to and from work, but excluding social benefits (see below);

(c) Wages or salaries payable to employees away from work for short periods, for example, on holiday or as a result of a temporary halt to production, except during absences due to sickness, injury, etc.;

(d) Ad-hoc bonuses or other exceptional payments linked to the overall performance of the enterprise made under incentive schemes;

(e) Commissions, gratuities and tips received by employees: these should be treated as payments for services rendered by the enterprise employing the worker, and so should also be included in the output and gross value added of the employing enterprise when they are paid directly to the employee by a third party.

4.67 Wages and salaries in cash do not include the reimbursement by employers of expenditures made by employees in order to enable them to take up their jobs or to carry out their work. For example:

(a) The reimbursement of travel, removal or related expenses made by employees when they take up new jobs or are required by their employers to move their homes to different parts of the country or to another country;

(b) The reimbursement of expenditures by employees on tools, equipment, special clothing or other items that are needed exclusively, or primarily, to enable them to carry out their work.

4.68 Wages and salaries in cash also do not include social insurance benefits paid by employers in the form of: (a) children's, spouse's, family, education or other allowances in respect of dependants; (b) payments made at full, or reduced, wage or salary rates to workers absent from work because of illness, accidental injury, maternity leave, etc.; and (c) severance payments to workers or their survivors who lose their jobs because of redundancy, incapacity, accidental death, etc. In practice, it may be difficult to separate payments of wages or salaries during short periods of absence due to sickness, accidents, etc., from other payments of wages and salaries, in which case they have to be grouped with the latter.

*Wages and salaries in kind*

4.69 Payments in kind are defined as goods and services provided to employees that are not necessary for work and can be used by employees in their own time, and at their own discretion, for the satisfaction of their own needs or wants or those of other members of their households. Almost any kind of consumption good or service may be provided as remuneration in kind. The following includes some of the most common types of goods and services provided without charge, or at reduced prices, by employers to their employees:

(a) Meals and drinks, including those consumed when travelling on business*;*

(b) Housing services or accommodation of a type that can be used by all members of the household to which the employee belongs;

*(c)* Uniforms or other forms of special clothing that employees choose to wear frequently outside of the workplace as well as at work;

(d) The services of vehicles or other durables provided for the personal use of employees;

(e) Goods and services produced as outputs from the employer's own processes of production, such as free travel for the employees of railways or airlines, or free coal for miners;

(f) Sports, recreation or holiday facilities for employees and their families;

(g) Transportation to and from work, car parking;

(h) Child-care for the children of employees.

4.70 The money value of payments in kind should be expressed as equal to the net cost to the employer of the goods or services concerned. Where the employer is unable to report the actual cost incurred, it is convenient to use producers' selling prices or wholesale prices.

4.71 Remuneration in kind may also include the value of the interest foregone by employers when they provide loans to employees at reduced, or even zero rates of interest for purposes of buying houses, furniture or other goods or services. Its value may be estimated as the amount the employee would have to pay if average mortgage, or consumer loan, interest rates were charged less the amount of interest actually paid.

*Stock options*

4.72 Stock options are a form of income in kind that results from the practice of an employer giving an employee the option to buy stocks (shares) at some future date at a certain price and under some specific conditions. They provide employees the right, but not the obligation, to purchase stock options. Options are usually granted to encourage

employees to stick around and help the company grow. The stock option is similar to a financial derivative and the employee may not exercise the option, either because the share price is now lower than his option price or because he no longer works for that employer and so forfeits his option. The following is a description of how stock options are valued, taking into account the probability that not all the options are exercised.

4.73 Typically an employer informs his employees of the decision to make a stock option available at a given price (the strike price or exercise price) after a certain time under certain conditions (for example, that the employee is still in the enterprise's employ, or conditional on the performance of the enterprise). The "grant date" is when the option is provided to the employee, the "vesting date" is the earliest date when the option can be exercised, the "exercise date" is when the option is actually exercised (or lapses). In some countries the permissible length of time between vesting and exercise date is quite long; in others it is very short.

4.74 The valuation of the options may be estimated using a stock options pricing model or as the difference between the market price and strike price at the vesting date. (If the market price is lower than the strike price, the option has zero value as it would not be exercised). The time of recording should be spread over the period between the grant date and vesting date, if possible. If this is not possible, the value of the option should be recorded at vesting date. Any change in value between the vesting date and exercise date is not treated as compensation of employees but as a holding gain or loss.

4.75 Elements of labour cost that are not regarded as employee income are not included in the concept of compensation of employees. As a cost to the employer, they are included in the intermediate consumption (item 9.1) of the establishment. Following are included in this category:

(a) Tools or equipment used exclusively, or mainly, at work;

(b) Clothing or footwear of a kind that ordinary consumers do not choose to purchase or wear and which are worn exclusively, or mainly, at work; e.g., protective clothing, overalls or uniforms. However, uniforms or other special clothing that employees choose to wear extensively off-duty instead of ordinary clothing should be treated as remuneration in kind;

(c) Accommodation services at the place of work of a kind that cannot be used by the households to which the employees belong: barracks, cabins, dormitories, huts, etc;

(d) Special meals or drinks necessitated by exceptional working conditions, or meals or drinks provided to servicemen or others while on active duty

(e) Transportation and hotel services provided while the employee is travelling on business;

(f) Changing facilities, washrooms, showers, baths, etc. necessitated by the nature of the work;

(g) First aid facilities, medical examinations or other health checks required because of the nature of the work.

4.76 Employees may sometimes be responsible for purchasing the kinds of goods or services listed above and be subsequently reimbursed in cash by the employer. Such cash reimbursements must be treated as intermediate expenditures by the employer and not as part of the employee's wages and salaries.

***Breakdown of wages and salaries of employees***

4.77 In order to ensure that the output of own-account production of intellectual property products are properly estimated, it is recommended that wages and salaries data for these categories of employees, namely, (a) research and development (item 3.1.1.1), (b) mineral exploration and evaluation (item 3.1.1.2), (c) software and databases development (item 3.1.1.3), and (d) production of entertainment, literary and artistic originals (item 3.1.1.4), be reported separately.

4.78 To provide a more precise measure of wage and salary levels, it is also recommended in infrequent surveys to collect data on wages and salaries paid to full-time and part-time employees, to outworkers, by occupation and to obtain details by gender.

***Payments to directors of incorporated enterprises for their attending meetings (item 3.2)***

4.79 This item includes all payments made to directors of incorporated enterprises and members of shareholders' committees for attendance at meetings.

***Social insurance contributions payable by employers (item 3.3)***

4.80 Employers' social contributions are social contributions payable by employers to social security funds or employment-related social insurance schemes to secure social benefits for their employees. To be treated as social insurance contributions, one of three conditions must be met (i) benefactor (or policy holder) must be obliged or encouraged by law or by the conditions of employment to participate, (ii) the scheme must be operated on behalf of the group and restricted to group members, (iii) employers make a contribution on behalf of employees. These insurance schemes maybe operated by the employers or a third party. Social insurance contributions may be classified into the following items:

(a) Social security

(b) Pension funds

(c) Health insurance

(d) Term (life) insurance

(e) Other payments

4.81 Employers may pay at their own will to the employees for sickness, maternity, employment injury, family allowance, termination pay and other employee benefits, these payments are treated as part of compensation of employees.

## 4. Other expenditures

### *4 (a) Purchases of goods and services*

4.82 The scope of the items included under this heading delineates the boundaries set in the national accounts in respect of the intermediate consumption of goods and services. Purchases of goods and services include the value of all goods and services purchased during the reference period for resale or intermediate consumption in the production process for which the establishment took title excluding fixed assets, the consumption of which is registered as consumption of fixed capital (depreciation - item 11.4). The goods and services concerned may be either resold with or without further transformation, completely used up in the production process or, finally, be stocked.

4.83 The data obtained should cover the materials that enter directly into the goods produced, which include all raw materials, pre-fabricated parts (intermediate products), components and so on that are physically incorporated into the products of the establishment. Fuels that enter the product directly should be included, as well as fuels for the generation of electricity and the production of gas and steam, whether for own consumption or for sale) auxiliary materials consumed during the production process, including lubricants, water, explosives, polishes, small tools and appliances, office supplies and similar materials that are normally used up in the production process should be included. Also included are the purchases of materials used for the own-account fixed assets formation and major repair by the unit.

4.84 If the establishment contracts out some work to other establishments including the other establishments of the same enterprise and it provides the raw materials, supplies and the like to them for the purpose, the value of these raw materials and supplies should be included under this item.

4.85 Amount payable for purchase of services during the reference period is also included regardless of whether they are industrial or non-industrial. Also included are payments for all work carried out by third parties on behalf of the establishment including current repairs and maintenance, and technical studies. Amounts paid for the installation of capital goods and the value of capitalized goods are excluded

4.86 The valuation of goods purchased should be in purchasers' prices - that is, the delivered value at the establishment, including the purchase price, transport charges either invoiced by the producer or by other organisations, the cost of insurance, the value of packaging materials charged for, all taxes and duties on the goods but, where applicable, excluding the deductible value-added tax (VAT). Discounts (including cash discounts if netted off purchases in purchase records) or rebates allowed to the purchaser and the value of packaging materials returned to the suppliers should be deducted. Where transport is carried out by the statistical unit itself, no charges should be imputed.

4.87 The treatment of goods received from other establishment of the same enterprise depends on whether the receiving establishment assumes the economic ownership of it or not. In other words, whether the receiving establishment uses the goods received for producing a good or for providing service (goods for processing). For example, an oil refinery processing crude oil that it owns is producing a good (refined petroleum); if the same refinery processes crude oil belonging to another unit, then it is providing a refinery service to that unit.

4.88 If the establishment receiving the good has no discretion about the level of production, the price to be charged for the good or the destination of the good, there is evidence that the establishment has not taken economic ownership of the goods being processed and the value of the output should be treated as the processing element only. This is the case for the refinery service cited above.

4.89 Goods received by the establishment from other establishments of the same enterprise for production of good should be valued as if purchased. In practice, it will usually be necessary to accept the book values in the accounts of the shipping establishment, but where transport of the goods to the recipient establishment is carried out by outside organisations; the transport costs should be included. Where returns of goods are made after being recorded in the inventory, the items should be recorded as sales in the same condition as received (see item 4.5). Goods received by the establishment from other establishments of the same enterprise for processing should not be treated as if purchased.

***Cost of raw materials and supplies except gas, fuels and electricity (item 4.1)***

4.90 This item includes all goods (excluding fixed assets) delivered to the control of the establishment in the reference period and owned by the establishment (or by the legal entity to which the establishment belongs). The time of receipt of the goods should be related to the definition of inventories (item 6) in the sense that goods should be considered as received at the time such goods are entered in the inventory account of the establishment. Alternatively, goods may be considered as received when the establishment has acquired economic ownership of the goods. In general, this definition coincides with the time of acquisition of title or the time of invoicing, but goods received from abroad should be included even though legal title may not yet have passed.

***Purchases or receipts of raw materials and supplies from other enterprises (item 4.1.1)***

4.91 This item includes the value of raw materials and supplies and the like or pre-fabricated parts (intermediate products) as enumerated under item 4.1 which are purchased or received from other enterprises

***Value of raw materials and supplies delivered by other establishments of the same enterprise (item 4.1.2)***

4.92 This item covers the value of raw materials and supplies and the like or pre-fabricated parts (intermediate products), purchased or, manufactured by one establishment of an enterprise and transferred to another establishment of the same enterprise, which further manufactures them, incorporates them into other products or employs them otherwise in its own production process. These should be valued as if purchased from another enterprise.

***Cost of materials for own-account fixed assets formation or major repair (item 4.1.3)***

4.93 This item includes the cost of raw materials and other materials purchased or received by the establishment for the production by the unit itself of capital goods for its own use (or for rental or lease) and materials and parts used for own-account major repair on its own buildings, structures, machinery and other fixed assets. Included are materials and the like for the construction of employee-occupied dwellings and other staff facilities and for the major repair of all establishment-owned or rented buildings, except housing accommodation. (For housing accommodation, it might be useful to attempt to ascertain the repair and maintenance cost involved, which should be attributed to the cost of workers' housing under wages and salaries in kind, along with imputations to cover the cost of labour, overhead and so on.)

4.94 The cost of materials for own-account fixed assets formation should be recorded separately for intellectual property products, namely, (a) research and development (item 4.1.3.1), (b) mineral exploration and evaluation (item 4.1.3.2), (c) software and databases development (item 4.1.3.3), and (d) production of entertainment, literary and artistic originals (item 4.1.3.4) and also for fixed asset formation and major construction (item 4.1.3.5).

***Cost of gas, fuels and electricity purchased (Item 4.2)***

4.95 This item includes the cost of all purchased gas, fuels and electricity received by the establishment only if they are purchased to be used as fuel. Energy products purchased as a raw material or for resale without transformation should be excluded and recorded in item 4.1 or 4.5 respectively. Fuels that enter the product or are used for other energy production should be included under materials. For convenience, gasoline and other fuels for vehicles are included, although some countries are using measures that more accurately reflect fuel consumption in the production process, and they have set up a separate category for motor-vehicle running expenses, which includes fuels for

vehicles. Fuels and electricity used for heating and lighting are also included, except when used for employee-occupied dwellings owned or operated by the establishment. (The latter should be recorded separately in order to measure this portion of the cost of workers' housing borne by employers, which, in turn, represents wages and salaries in kind under compensation of employees.) Excluded are fuels produced and consumed in the same establishment.

***Cost of individual fuels and gas purchased (item 4.2.1)***

4.96 The selection of individual fuel types will be determined by national usage. The following is a suggested list of principal fuel types: (a) coal, (b) coke, (c) crude oil, (d) natural gas, (e) petroleum products, (f) biomass[7] and (g) other fuels. Individual countries may wish to separate one or more of the fuel types grouped in "petroleum products" and "other fuels". To ensure a complete coverage of this item, the cost of the individual items should be included.

***Cost of electricity purchased (item 4.2.2)***

4.97 This item includes the cost of all electricity purchased by the establishment during the reference period.

***Cost of water and sewerage services (item 4.3)***

4.98 This item includes the cost of water and sewerage services purchased by the establishment during the reference period.

4.99 When collecting data on water and sewerage surveys via general business surveys it is important to collect a name of someone that can be contacted for additional information on the physical use of water and wastewater treatment and discharges. Often surveys are filled in by business managers or accountants and they will not always know the physical quantities involved.

4.100 For surveys of specialised producers (i.e. ISIC 36 and ISIC 37) additional data items are required to produce water accounts. These items include:

- losses in distribution;
- sources of water (groundwater, surface water, collection of rain, desalinization);
- location of water abstractions and discharges.

[7] Biomass seems a synonymous of biofuels. "Biofuels are fuels of biological and renewable origin, such as fuel wood, charcoal, livestock manure, biogas, biohydrogen, bioalcohol, microbial biomass, agricultural waste and byproducts, energy crops, and others." from FAO http://www.fao.org/sd/EGdirect/EGre0055.htm

***Cost of water purchased (item 4.3.1)***

4.101 This item is defined as the total cost of all water purchased by the establishment for business purposes during the reference period.

***Cost of sewerage services purchased (item 4.3.3)***

4.102 This item includes cost of sewerage services purchased by the establishment during the reference period.

***Purchase of services except rentals (item 4.4)***

4.103 This item includes cost all services payable by the establishment during the reference period regardless of whether they are industrial or non-industrial.

***Cost of industrial services purchased and also delivered by other establishments of the same enterprise (Item 4.4.1)***

4.104 This item covers amount payable by the establishment for contract, commission repair and maintenance work carried out during the reference period by other establishments of the same enterprise and by other enterprises. Where the work is carried out by other enterprises, the actual invoice prices should be used, but, where applicable, the deductible value-added tax should be excluded. Freight charges should be included. Where the services are carried out by other establishments of the same enterprise, equivalent commercial values at basic prices (excluding taxes on products and transport cost) should be used or an imputed valuation of the work should be made, including an imputed margin for overhead costs and profits, as well as the cost of materials consumed and labour used. The same values should be used for both the contributing and receiving establishments, when both submit returns. The categories to be covered are further defined below.

***Maintenance, repair and installation (except construction) services (Item 4.4.1.1)***

4.105 This item includes the maintenance and repair work of industrial nature, included under Group 871 of the CPC, Ver. 2, such as maintenance and repair services of fabricated metal products, except machinery and equipment; maintenance and repair services of office and accounting machinery; maintenance and repair services of computers and peripheral equipment; maintenance and repair of transport machinery and equipment; and maintenance and repair services of other machinery and equipment. Payments for the installation of goods sold by the establishment on an installed basis and service on goods sold are included, but amounts paid for the installation and major repairs of capital goods are excluded

***Contract and commission work (item 4.4.1.2)***

4.106 This item covers the payments made by an establishment for a work that is outsourced to another unit. It covers work done by others including the other establishment of the same enterprise, on materials owned by the establishment, which generally entails the transformation or processing of raw materials; specialized work performed on products made by the establishment is included. Also included are payments made through subcontractors to outworkers not on the payroll (leased employment – item 4.4.1.2.1).

***Costs of non-industrial services purchased and also delivered by other establishments of the same enterprise (item 4.4.2)***

4.107 This item covers amount payable by the establishment during the reference period for services of a non-industrial nature. The actual payments made should be reported, less deductible VAT. Costs on following are included: (a) communication services (item 4.4.2.1); (b) transport services (item 4.4.2.2); (c) advertising and promotional services (item 4.4.2.3); (d) financial services (excluding interest payments (item 4.4.2.4)); and (e) other non-industrial services (item 4.4.2.9).

4.108 The following items should be excluded: dividends and interest paid; fines and the like paid; outright purchases of patents and licences; purchases of land and other capital goods; donations; bad debts; depreciation.

***Maintenance and repair of buildings and structures (item 4.4.2.1)***

4.109 This item covers current repair and maintenance work on buildings and other structures of the establishment and in respect of rented buildings other than housing accommodation. The repair and maintenance costs of employee-occupied dwellings should not be included but should be recorded separately in order to calculate the total cost of workers' housing borne by employers for compensation of employees in kind.

***Purchase of communication services (item 4.4.2.2)***

4.110 This item includes the costs payable by the establishment for purchase of postal and telecommunication services, including mobile phone services, fax, internet etc.

***Transport services (item 4.4.2.3)***

4.111 This item includes the cost payable by the establishment for hired transport only. The transport carried out by the unit itself should not be included since the costs are covered in other items.

***Advertising and promotional services (item 4.4.2.4)***

4.112 This item includes all expenses payable by the establishment for advertising through television, newspapers and other media as well as promotional payments and payments for market research activities and public relation activities carried out by a third party. Market research undertaken by the unit itself should be excluded.

***Financial services (item 4.4.2.5)***

4.113 This item includes fees and charges directly payable for financial intermediation services and indirect outlays for purposes of financing the acquisition of fixed assets - for example, flotation costs in respect of security issues such as underwriters' commissions and registration charges, service charges in respect of loans. Interest payments are not included.

***Other non-industrial services (item 4.4.2.9)***

4.114 This item includes purchases of services such as legal services, accounting and bookkeeping services, managing and consulting services, entertainment, travelling and subsistence, contributions to business and professional associations, newspaper and periodical subscriptions, costs of meetings of the governing bodies and shareholders; and other services n.e.c. Patent and licence fees (but not the value of outright purchases of patents and licences) should also be included.

4.115 In case the case of multi-establishment enterprises, data at the establishment level are available only for certain non-industrial services, such as communication costs and rental payments. Other non-industrial services, such as advertising, legal, accounting and other professional services, are charged at the enterprise level and therefore, are available in the books of account of the enterprise only. These costs will be recorded with the headquarter establishment in a multi-establishment enterprise.

4.116 In order to estimate national accounts value added at the establishment level, expenses relating to the non-industrial services available at the enterprise level need to be allocated back to the concerned individual establishments, either according to the proportion of total enterprise wages and salaries or the output of each establishment, or by assigning to each establishment of the multi-establishment enterprise estimated costs for the specific service as reported by the single-establishment enterprises of similar size and in the same type of industry. This requires that data on non-industrial services by establishments be collected and cross-referenced with the data on enterprises that own them. The allocation to establishments can best be done by data collection and processing unit. The concept of value added obtained then is close to national accounts value added but not yet equal due to the fact that the accounting for some non-industrial services such as financial intermediation charges indirectly measured and insurance service charges can be implemented by national accountants only at the macro level. In addition, other differences are the result of more proper valuation of changes in inventories and global balancing of supply and use of goods and services in the total economy.

***Purchase or receipt of goods and services for resale in the same condition as received (item 4.5)***

4.117 This item includes the value of all goods and services purchased from other enterprises or produced or purchased by other establishments of the same enterprise and transferred to the reporting establishment for resale to third parties without transformation. Resale without transformation is considered to include sorting, grading and assembling, mixing, bottling, packing, breaking bulk and repacking of goods, etc.

4.118 Purchases of goods should be recorded net of returns, discounts, rebates, and other allowances received. The value of goods and services which are sold to third parties on a commission basis are excluded since these goods are neither bought nor sold by the agent receiving the commission. Services for resale referred to here are the output from service activities, rights to use predetermined services (such as fax or photocopying services), or physical supports for services (e.g., paying a third party to deliver your goods and then passing on the cost to the consumer who is buying them).

4.119 The goods should be valued at purchaser's prices including delivery and similar charges involved in the purchase (e.g., transport charges, the cost of insurance, the value of packing, etc.) and all taxes and duties on the products, but excluding deductible VAT and other deductible taxes. The purchaser's price should also include the value of goods traded in or bartered in payment for the purchase. Transfers from other establishments of the same enterprise should be valued as though purchased. When this is not possible in practice, transfers might be valued at cost to the enterprise on delivery to the establishment, that is, original purchase price, delivery and similar charges, labour and material directly used and possibly overhead. This item 4.5 after deducting from item 5.1.2 would provide trade margins generated by the manufacturing establishments.

4.120 Subject to the country practice of recording the purchases, their value should be adjusted for changes in inventories of goods for resale. Some countries record the purchases of goods for resale when they enter in the production process, other in contrast, record the purchases when acquired or invoiced. The purchases by the latter group of countries are expected to be adjusted for the changes in inventories of goods for resale. Moreover, the later group of countries should correct the values for any holding gains or losses generated in the prices of purchased goods in order to estimate them at the prices prevailing when the resale takes place.

***Rental payments (item 4.6)***

4.121 This item includes all costs payable by the unit for hiring, leasing or renting capital goods and non-residential buildings etc. Financial leasing payments are excluded. Rental payments should be subdivided into:

- Rental payments for machinery and equipments (item 4.6.1)

- Rental payments for dwellings and structures (item 4.6.2).

***Non-life insurance premiums payable on establishment property (item 4.7)***

4.122 This item includes non-life insurance premiums payable by the unit during the reference period on the unit property (e.g. against damages due to fire, natural calamities, losses etc.).

**Data items on quantity (item 4. (b))**

4.123 Data on quantity of goods and services purchased are useful for several purposes and the same may be collected through industrial surveys.

***Quantity of individually important materials and supplies (item Q4.1)***

4.124 This item should normally be collected to provide supplementary detail in infrequent and annual inquiries. In the infra-annual inquiries, the detail can be limited to those items required for the preparation of index numbers of production or price. In country practice, questionnaires are generally tailored to each industry, listing the significant materials relevant to the particular industry. To measure consumption, it may also be desirable to obtain the quantity and value of individually important stocks of those materials that tend to fluctuate widely.

***Quantity of individual fuels and gas purchased (item Q4.2)***

4.125 In order to calculate energy consumption, it is necessary to collect the quantity of the individually important fuels purchased and the quantity of electricity purchased, generated and sold.

4.126 The selection of individual fuel types will be determined by national usage. The following is a suggested list of principal fuel types: (a) coal, (b) coke, (c) crude oil, (d) natural gas, (e) petroleum products, (f) biomass and (g) other fuels. Individual countries may wish to separate one or more of the fuel types grouped in “petroleum products” and "other fuels". The quantity should be obtained for each fuel type listed separately. Each physical quantity of fuel type should be reported in the original unit as well as in terajoules. If there is no homogeneous physical measure - as it may be the case of “petroleum products” and “other fuels” – physical quantities of fuel purchased should be reported in terajoules (UN 1982). The collection of fuel data in standard physical units permits the estimation of total energy consumption by the statistical organisation conducting the census or annual inquiry. Excluded are fuels produced and consumed in the same establishment.

***Quantity of electricity purchased (item Q4.2.1)***

4.127 This item is defined as the quantity (in kilowatt-hours) of all electricity purchased by the establishment during the reference period.

***Quantity of electricity generated (item Q4.2.2)***

4.128 This item is defined as the total quantity (in kilowatt-hours) of electricity generated in the establishment (gross less generating-station use) during the reference period, including any part of the energy sold or transferred.

***Quantity of electricity sold (item Q4.2.3)***

4.129 This item is defined as the quantity (in kilowatt-hours) of electricity sold to other enterprises or transferred to other establishments of the same enterprise during the reference period.

***Total energy consumed (item Q4.2.4)***

4.130 This item is derived by adding the total energy equivalent of fuels consumed to the total consumption of electricity, both expressed in terajoules. The terajoule is the standard of measurement recommended for reporting total energy consumed (UN, 1987). The joule is a unit of work or energy equivalent to the amount of work done or heat generated by a current of one ampere acting for one second against a resistance of one ohm. (There are 3.6 million joules in one kilowatt-hour.) The calculation of total energy consumption is an important feature of any industrial inquiry.

4.131 The data for individual fuels, collected in standard physical units, are converted into terajoules by the statistical office compiling the data. Where it is known that stocks of fuels tend to fluctuate widely, it may be desirable to request quantities of the individual fuels in stock at the beginning and end of the reference period. This will enable the compilers of the data to estimate fuel consumption more accurately than would be possible using estimates based on purchases. Quantities of fuels consumed by the establishment out of its own production should also be collected and included where this consumption is important.

4.132 The quantity of electricity consumed is equal to the quantities purchased and generated, less the quantity sold. However, for the electricity industry (ISIC 3510), consumption is defined as the quantity of electricity used by the producers, transmitters and distributors of electricity in their establishments, but excluding the electricity used for auxiliary services, pumping and network losses.

***Quantity of water purchased (item Q4.3.1)***

4.133 This item is defined as the total quantity (in cubic meters) of all water purchased by the establishment during the reference period.

***Quantity of water abstracted for own use (item Q4.3.1.1)***

4.134 This item is defined as the total quantity (in cubic meters) of water abstracted from the environment by the establishment during the year, including any water sold or

transferred. Saltwater (e.g. sea water, saline ground water) is excluded unless it is desalinized prior to use.

***Quantity of water sold (item Q4.3.1.2)***

4.135 This item is defined as the total quantity (in cubic meters) of all water sold by the establishment to other enterprises or transferred to other establishments of the same enterprise during the reference period.

***Total water used (item Q4.3.1.3)***

4.136 This item is derived by adding the total water used expressed in cubic meters. The calculation of total water used is an important indicator of pressure of the economy on the water resources.

***Quantity of wastewater treated on site prior to discharge (Item Q4.3.2)***

4.137 This item is defined as the total quantity (in cubic meters) of wastewater treated by the establishment before being discharged to the environment by the establishment during the reference period, including any wastewater services sold or transferred.

***Quantity of wastewater discharged without treatment (item Q4.3.3)***

4.138 This item is defined as the total quantity (in cubic meters) of wastewater discharged without treatment to the environment by the establishment during the reference period.

## 5. Turnover, sales, shipments, receipts for services and other revenue (excluding property income)

### 5 (a) Turnover, sales, shipments, receipts for services and other revenues

4.139 The scope of the items included delineates the boundaries set in the national accounts recommendations in respect of the production of goods-and services.

4.140 This item comprises the amount invoiced by the establishment during the reference period and corresponds to market sales (shipments[8], receipts for services and other revenues) of goods or services both primary and secondary including goods and services transferred to other establishments of the same enterprise. Shipments/sales/turnover should exclude VAT (value added tax) and other similar deductible taxes directly linked to the sales as well as all duties and taxes on products invoiced by the unit which is equivalent to the valuation at basic prices in the System of National Accounts. Included are all other invoiced charges for transport, packaging, etc.,

[8] Value of shipments replaces sales when the establishment delivers the good to other establishments of the same enterprise.

passed on to the customer, even if these charges are listed separately in the invoice. Price rebates, discounts and similar allowances granted on returned goods and the value of returned packaging should be deducted.

4.141 In principle, sales/shipments to other establishments within the same enterprise should be valued as though sold. In practice, however, it may be necessary to accept the book value of such transfers. Book value or production cost is equal to the sum of material and service costs, compensation of employees, other taxes on production, depreciation of the fixed assets used in production, and an imputed margin for overhead costs and profits if possible. Where both establishments are included in the collection programme, the receiving establishment should report the same items as purchases at the same value as the sales of the shipping establishment.

4.142 This item also includes sales of goods and services purchased for resale and commissions and fees from selling goods on account of others and all receipts for industrial services rendered, such as receipts for contract work performed for others, installation and repair work, research and development work of an industrial nature.

4.143 Revenues from activities other than the sale of goods or rendering of industrial services like revenues from rental or lease of buildings and machinery and equipment, all other miscellaneous revenues as well as the value of fixed assets manufactured or built by the establishment for its own use are also included.

4.144 The terms shipments, sales, receipts, turnover etc. are used interchangeably in the economic statistics and business accounting to denote the revenues of producer units. For the purpose of present recommendations the term turnover is used. However it is recognized that there is a wide variation between countries in the scope of different types of revenues. The relationship between the concepts of shipments, sales, receipts and turnover in terms of their component items are summarised in table 4.1 below:

**Table 4.1. Comparison between turnover/sales, revenue and receipts concepts**

| Component/item | Turnover/ Sales | Operating Revenue | Total Revenue | Total Receipts |
|---|---|---|---|---|
| Gross sales of goods | yes | yes | yes | yes |
| Provision of services | yes | yes | yes | yes |
| Shipping and handling | yes | yes | yes | yes |
| Installation | yes | yes | yes | yes |
| Maintenance and repair | yes | yes | yes | yes |
| Alteration | yes | yes | yes | yes |
| Storage | yes | yes | yes | yes |
| Receipts from the rental of vehicles, equipment, instruments, tools, and other merchandise | yes | yes | yes | yes |
| Commissions from the arrangement of financing | yes | yes | yes | yes |
| Payments for work in progress | yes | yes | yes | yes |
| Market value of compensation received in lieu of cash | yes | yes | yes | yes |
| Gross sales from departments, concessions, and | yes | no | no | yes |

| Component/item | Turnover/ Sales | Operating Revenue | Total Revenue | Total Receipts |
|---|---|---|---|---|
| amusement and vending machines operated by others | | | | |
| Units share of sales from departments, concessions, and amusement and vending machines operated by others | no | yes | yes | no |
| Amounts received from work subcontracted to others | yes | no | no | yes |
| Consumption, sales, and value added taxes | no | no | no | yes |
| Proceeds from the sale of real estate, investments, or other assets held for resale | no | no | no | yes |
| Income from interest and dividends | no | no | yes | yes |
| Rental of real estate | no | no | yes | yes |
| Contribution, gifts, loans and grants | no | no | yes | yes |
| Reduction in prices, rebate, discounts and returned packing | no | no | no | no |
| All duties and taxes on the goods or services invoiced by entity | no | no | no | no |
| Operating subsidies received from public authorities | no | no | no | no |

Source: Compilation Manual for an Index of Service Production (OECD 2007), available from http://www.oecd.org/findDocument/0,2350,en_2649_34257_1_119669_1_1_1,00.html

### *Value of shipments, sale, turnover, including transfers to other establishments of the same enterprise (item 5.1)*

4.145 This item includes the value of shipments, including transfers during the inquiry period to other establishments of the same enterprise; of all goods made by the establishment, whether in the reference period or in previous periods (that is, all goods for which the establishment relinquished control during the period; all goods sent abroad for sale or processing should be included even though legal title may not yet have passed). Included as goods produced by the establishment are goods produced by other organisations from materials supplied by the establishment.

4.146 The data obtained should cover all shipments of principal products, secondary products, by products, water supply, sewerage, waste management and remediation activities arising from the production process; and all sales of electricity, gas and steam, whether purchased or produced by the establishment.

4.147 If the establishment engages in the production of goods under contract with a long-term production cycle, progress payments receivable for under such contracts should be included here as sale, not as work-in-progress. This is applicable to both the construction work and the production of machinery and equipment. When no contract exists, partially completed or finished construction works and machinery should be recorded in the inventory under work-in-progress or finished goods (item 6.4).

4.148 The valuation of goods shipped should be at the establishment price charged to, the customer, whether ex-factory or delivered, including all charges invoiced to clients, even if separately, for expenses relating to transport (whether carried out by the

establishment with its own transport facilities or by outside organisations), lost packaging and the like. Price rebates and discounts and allowances on returned goods allowed to the customer and the value of returned packaging should be deducted. This includes cash discounts where netted off sales in sales records. The valuation should exclude all duties and taxes imposed on products when they leave the establishment, including the value-added tax invoiced by the producer to the client, where the value-added tax system is applicable.

***Sale/Turnover/Value of shipments of goods produced to other enterprises (item 5.1.1.1)***

4.149 This item includes sales or shipments of goods produced by the establishment, as defined under item 5.1, to other enterprises.

***Transfer of goods produced to other establishments of the same enterprise (item 5.1.1.2)***

4.150 This item covers transfers from the producing establishment to another establishment of the same enterprise, including transfers to wholesale and retail trade establishments of the enterprise for which separate accounts are kept. Transfers from the producing establishment to another establishment of the same enterprise for further processing should also be included. These should be valued as if sold to an independent enterprise. If this is not possible, the actual production costs should be reported.

***Exported to customers and affiliated foreign branches (item 5.1.1.3)***

4.151 This item includes the sales or shipments of goods produced by the establishment which has been exported to customers and also transfers to affiliated overseas branches.

***Value of shipments/sales/turnover of all goods and services purchased for resale in the same condition as received (item 5.1.2)***

4.152 This item includes the sale/turnover or bartered of goods and services purchased for resale by the establishment. The sale/turnover should exclude VAT (value added tax) and other similar deductible taxes directly linked to the sale/turnover, which are collected from the customers and paid directly to government tax authorities, as well as all duties and taxes on the goods and services invoiced by the unit. Included are all other invoiced charges for transport, packaging, etc. passed on to the customer, even if these charges are listed separately in the invoice. Price rebates, discounts and similar allowances granted on returned goods and the value of returned packaging should be deducted from the sale/turnover.

4.153 The item also includes the goods withdrawn by the owners of a establishment for their own use. Those goods should be valued at the appropriate market price (i.e. as if sold to a customer). If this is not possible, the owners' withdrawals should be valued at acquisition costs.

4.154 The goods and services purchased for resale may either be sold to final consumers, other enterprises or transferred to other establishments of the same enterprise.

***Receipts for industrial work done or industrial services rendered to others (item 5.1.4)***

4.155 This item covers the value, at actual invoice prices, of industrial work done and services rendered to other enterprises (item 5.1.4.5) and to other establishments of the same enterprise (item 5.1.4.6). The invoice prices should exclude VAT (value added tax) and other similar deductible taxes directly linked to the sales as well as all duties and taxes on the goods and services invoiced by the unit. The amounts charged for materials supplied by the establishment in the course of the work should also be included. Services provided to other establishments within the same enterprise should be valued as though sold. If this is not possible, the actual production costs should be reported. The following categories of industrial work should be identified separately:

- Contract and commission work (item 5.1.4.1)

- Maintenance, repair and installation (except construction) services (item 5.1.4.2) Installation work (item 5.1.4.2.1)

- Research and development work of an industrial nature (item 5.1.4.4)

***Contract and commission work (item 5.1.4.1)***

4.156 Contract and commission work includes cases when a production unit (contractor) carries out specific aspects of the production activity like, processing, transforming, assembling or fabricating the materials as ordered by another productive unit (principal), in whole or in part in the production of a good or a service (see also outsourcing, paragraphs 1.20 -1.25). Sales commissions are not included. A sub-category (item 5.1.3.1.1) has been provided to permit the measurement of industrial work performed for units not residing in the country. This item is of particular significance in some developing countries.

***Other revenue (item 5.2)***

4.157 This item covers revenue receivable by the unit from activities other than the sale of goods or the rendering of services, which is not always ascertainable at the establishment level. The values reported should be the actual amounts received, excluding VAT (value added tax) and other similar deductible taxes directly linked to the sales as well as all duties and taxes on the goods and services invoiced by the unit. Information about revenue from the rental or lease of machinery and equipment (item 5.2.1) and the rental or lease of buildings (item 5.2.2) should be identified separately. Machinery and equipment includes vehicles, machinery, instruments, tools and others.

4.158 All remaining revenues not included in the above categories should be included in the item “Other revenues n.e.c.” (item 5.2.3). These include:

(a) Revenue from the operation of cafeterias, hostels, camps and other employee facilities, except dwellings (rent received from employee dwellings should not be included but should be netted off cost of workers' housing under compensation in kind);

(b) Receipts for transport services rendered to others, other than delivery of own products (the latter should be included in the value of shipments (item 5.1));

(c) Revenue from sales of scrap;

(d) Receipts for storage of goods, warehousing and the like, including cold storage;

(e) Commissions from the arrangement of financing;

(f) Receipts for the right to use patents, trademarks, copyrights and the like, manufacturing and quarrying rights, technical "know-how";

(g) Dealers' margins and other transfer costs in respect of transactions involving second-hand goods and scrap, land, intangible assets (financial claims, leases, mineral rights, patents); these cover brokers' commissions, legal fees and the like which represent the only output generated in such transactions; the output may be shared by the buyer and seller and, in some cases, may be charged to the buyer; and

(h) Any other revenue arising from the production of goods or rendering of services.

4.159 The following items that do not arise from the production of goods and rendering of services by the statistical unit should not be included:

(a) Dividend receipts;

(b) Interest and discount receipts;

(c) Revenue from the outright sale of patents and licences; and

(d) Revenue from the sale of land and used capital goods.

***Value of own-account fixed assets (item 5.3)***

4.160 This item includes the cost of all fixed assets, such as buildings and structures, machinery and equipment, etc., manufactured or built by the establishment for its own use during the reference period and having a service life of more than one year as well as the costs of extensions, alterations, improvements and major repairs that are carried out

by the establishment itself with its own labour force and that extend the service life or increase the productive capacity of existing fixed assets. Fixed assets produced for rental or lease should also be included.

4.161 The own-account fixed assets should be recorded at the time the work is put in place and the asset becomes part of the fixed capital formation of the establishment. The valuation, in principle, should be at the basic prices of the same assets sold in the market. However, it will frequently be necessary to impute the valuation at production cost by using information on wages and salaries of employees engaged in own-account fixed assets formation and major construction (item 3.1.1.5 ) and cost of materials for own account capital formation (item 4.1.3.).

## 5 (b) E-commerce

### *E-commerce sale/turnover/value of shipments/receipts for services or other revenues (item 5.4)*

4.162 The use of computer mediated network has transformed the traditional way of organizing the economic activities. It would be useful to develop indicators reflecting its use in the business. One such indicator may be e-commerce sales. E-commerce sales are sales of all goods and services where an order is placed by the buyer, price and terms of sale are negotiated over the Internet, an extranet, Electronic Data Interchange (EDI) network, or other online system. Payment may or may not be made online. The revenues from e-commerce sales are included in the total sales/shipment. Some countries have a separate 'of which' item for e-commerce sales in their retail/wholesale trade questionnaires. For those countries not recognizing yet e-commerce separately it is recommended either to launch a national survey on e-commerce or to update the existing economic surveys with additional questions about e-commerce sales.

4.163 This item includes the sales value of all goods and services sold through a computer-mediated network (e-commerce). Both business-to-business and business-to-consumer transactions are included. The revenues from e-commerce sales are part of Turnover, sales, shipments, receipts for services and other revenues (item 5. (a))

## 5 (c) Data items on quantity

### *Quantity of individually important products (item Q5.1)*

4.164 The sales/turnover of establishment may be broken down by products, both for goods and services, in terms of the Central Product Classification Version 2 (CPC, Ver.2) or other international/national product classifications by product. Figures should be obtained both for the total value of the products and the quantity of individually important products. This is best accomplished by designing questionnaires tailored to the individual industries which include a pre-printed list of the important products of each

industry. Where the establishment's range of activities encompasses several successive manufacturing stages, it may be useful to collect supplementary information on the quantity of selected important intermediate products produced and consumed within the establishment. These data are particularly useful if the intermediate products in question are the final products of many other establishments or are widely used as purchased materials. To measure production, it may be desirable to obtain the quantity and value of individually important stocks of the products at the beginning and end of the inquiry period. It is desirable to include the important industrial products identified by the United Nations Statistics Division* which forms the basis for the data collection on the industrial commodity production statistics.

## 6. Inventories

### *Total Inventories (item 6.1)*

4.165 This item comprises the value of all inventories owned by the parent enterprise and held by, or under the control of, the establishment, either at the establishment or elsewhere. Inventories held at ancillary units, in bonded stores or public warehouses, on consignment, in transit and materials being manufactured, processed or assembled on commission by others should be included. Materials owned by others but held by the establishment for processing should be excluded. Inventories held overseas should be included as the economic ownership rests with the unit holding the inventory.

4.166 For certain inquiries, data might be collected on the quantity and value of the stocks of individually important products and materials. This information would be particularly useful in those cases where the stocks of such goods are known to fluctuate widely.

4.167 The information on inventories is principally required to measure the value of changes in inventories (item 6.1.3). Changes in inventories comprise the difference (positive or negative) between the value of inventories at the end (item 6.1.2) and the beginning (item 6.1.1) of the reference period. It may also be measured by the value of entries into inventories less the value of withdrawals and the value of any recurrent losses of goods held in inventories. As an approximation of the overall value of changes during the period, the levels at both the beginning and end of the period could be valued at the appropriate average prices ruling over the period. If this approach were considered feasible, the value of changes during the period would be included as a collection item and the value of inventories at the beginning and end of the period would be less significant. In practice, however, it will usually be necessary to accept the current prices or the book values at the two points of time.

4.168 In general, inventories of materials, fuels and supplies acquired from others should be valued at purchasers' prices excluding deductible VAT and also excluding any rebates and discounts given by the seller. Work-in-progress and inventories of finished goods should be valued at equivalent basic prices (market prices excluding taxes on

* UN List of Industrial Products, available at http://unstats.un.org/unsd/industry/commoditylist2.asp?s=0

products, transport costs and trade margins) or at production costs if equivalent basic prices are not available. Production costs are equal to the sum of material and services costs, compensation of employees, other taxes on production, depreciation of the fixed assets used in production, and an imputed margin for overhead costs and profits if possible.

4.169 When goods are valued at book values, it is necessary to know, or assume, the order in which the goods are withdrawn since the withdrawals from stocks should be valued at the prices at which the goods can be replaced at the time they are withdrawn as distinct from the prices that may have been paid for them when they were acquired. The common methods of reporting withdrawals from stocks by units in their business accounting practices are:

(i) FIFO (first-in-first-out) – the cost of items sold or consumed during the reference period is calculated as though there were sold or consumed in the order of their acquisition.

(ii) LIFO (last-in-first-out) – the cost of items sold or consumed during the reference period is deemed to be the most recent acquisitions or production. This implies that withdrawals are valued approximately at current prices.

(i) Average cost – the cost of an item is determined by applying a weighted average of the cost of all similar items available for sale over a period of time.
(ii) Specific item cost - a method of tracking inventory when the actual cost of each item can be identified separately. Method, usually used for large, easily traceable items, such as vehicles or furniture.

4.170 Methods of valuation of inventories may vary according to the accounting practices of each statistical unit. In the absence of inflation all four of the inventory valuation methods would produce the same results. Unfortunately, over the long term, prices tend to rise, which means the choice of accounting method can significantly affect valuation. In order to estimate properly the changes in inventories, it is recommended that the method of valuation should be requested on survey forms.

4.171 Further details of current valuation are discussed by category of inventories in the following paragraphs.

***Inventories of materials, fuels and supplies (item 6.2)***

4.172 This item comprises all materials, components and the like that enter into the product, fuels, and repair, maintenance, office and other consumable supplies. The value of any inventories of materials and supplies for use in own-account fixed asset work should be included. Whenever possible, it is recommended to show the value of inventories of fuels separately.

4.173 In principle, the inventories should be valued at replacement cost, based on purchasers' prices. The prices should include any duties and taxes payable by the purchaser excluding deductible value-added tax, and should be net of any rebates and discounts given by the seller. Alternatively, the book values might be requested.

***Work-in-progress (item 6.3)***

4.174 This item refers to the value of output produced by an establishment that is not yet sufficiently processed to be in a state in which it is normally supplied to other enterprises or to other establishments of the same enterprise. Generally, it should include all work-in-progress for the account of others, irrespective of the arrangements for financing the work. However, that part of the work-in-progress on long-term contracts for which progress payments received should be treated as shipments and therefore not included in work-in-progress. Business accounting in most countries would capitalize own-account production of machinery and equipment, construction, and major improvement of assets, by recording the values of these goods and services in revenue side as in item 5.3. The same value is then entered as the acquisition of assets, which is then netted out by the same negative amount in current asset (to take care of "sales" that do not take place. In these cases, no value is recorded as work-in-progress for own-account production of fixed assets. In cases that countries do not capitalize own-account fixed assets in their business accounts, industrial statisticians must ask for these additional information.

4.175 If possible, an imputed valuation in terms of equivalent market basic prices should be adopted, including an imputed margin for overhead costs and profits, as well as the cost of materials consumed and labour used. Alternatively, the book values might be requested.

***Inventories of finished goods (item 6.4)***

4.176 This item includes all goods produced by an establishment as output that the producing establishment does not intend to process further before supplying them to other enterprises or final consumers. Finished goods held by another establishment that were processed by that establishment from materials owned by the respondent establishment should also be included. Finished goods held elsewhere – at ancillary units, in bonded or public warehouses, on consignment, in transit, and so on, should also be included. Finished goods held by the respondent establishment that were made from materials owned by others should be excluded.

***Inventories of goods purchased in the same condition as received (item 6.5)***

4.177 This item includes the value of all goods purchased by an establishment for the purpose of reselling them in the same condition as received to their customers. Although the goods have not been processed internally, they should be valued in the same manner as the finished products manufactured by the establishment, that is, in basic prices. The book values may also be used. Stocks of goods to be resold without processing or transformation and not expressly purchased for that purpose may also be included

## 7. Taxes and subsidies

### *Taxes (item 7.1)*

4.178 Taxes are compulsory unrequited payments, in cash or in kind, made by units to the government. Two main groups of taxes are identifiable - taxes on products and other taxes on production. This section recommends collecting only other taxes and subsidies on production as these payments or receipts affect the behaviour of producers and are recorded in their business accounts. It is recommended that in statistical questionnaires countries refer to the specific names and descriptions of taxes as they exist in their national fiscal systems.

### *Other taxes on production (item 7.1.1)*

4.179 Other taxes on production are taxes that the producing units are liable to pay as a result of engaging in production. As such they represent a part of production costs and should be included in the value of output. Units pay them irrespective of profitability or otherwise of the production. These taxes consist mainly of taxes on the ownership or use of land, buildings or other assets used in production, or on the labour employed or compensation of employees paid. Examples are motor road vehicle taxes, duties and registration fees, business licences, payroll taxes, taxes on non-life insurance on assets, levies on the use of fixed assets. Also included are official fees and charges - that is, duties payable for specific public services, such as the testing of standards of weights and measures, provision of extracts from official registers of crime and the like.

4.180 It may not be possible to collect data about all these taxes at establishment level as these taxes are paid for by the parent enterprise; therefore, in such cases the design of statistical questionnaires and subsequent data compilation should clearly indicate the type of taxes that have been reported.

### *Subsidies received (item 7.2)*

4.181 This item covers payments that government units make to resident producing units on the basis of their production activities or the quantities or values of the goods or services they produce, sell or import. Classification of subsidies follows closely the classification of taxes.

### *Subsidies on products (item 7.2.1)*

4.182 Subsidies on products correspond to subsidies payable per unit of a good or service produced, either as a specific amount of money per unit of quantity of a good or service, or as a specified percentage of the price per unit; it may also be calculated as the difference between a specified target price and the market price actually paid by a buyer.

***Other subsidies on production (item 7.2.2)***

4.183 Other subsidies on production consist of subsidies, except subsidies on products, which resident enterprises may receive as a consequence of engaging in production (e.g., subsidies on payroll or workforce, or subsidies to reduce pollution).

## 8. Output

***Gross output at basic prices (item 8.1)***

4.184 This item illustrates the result of the overall production activity of industrial units. Production (output) can not be directly observed from the accounting records of units. It is calculated from data items in the following groups: Turnover, sales, shipments, receipts and other revenues (item 5. (a)); Purchases of goods and services (item 4. (a)); and Inventories (item 6).

4.185 The data collected make it possible to calculate both the census output and the gross output difference being the exclusion or inclusion of the output from the activities that are non-industrial in nature.

4.186 The value of production corresponds to the sum of the value of all goods or services that are actually produced within an establishment and become available for use outside that establishment plus any goods and services produced for own final use.
The value of production at basic prices is calculated as follows:

Gross output = Value of shipments/turnover/sales of goods or services produced by the establishment (Item 5.1.1)

+ Value of sale/turnover/shipments of all goods and services purchased for resale in the same condition as received (item 5.1.2)

- Purchases of goods and services for resale in the same condition as received (item 4.5)

+ Receipts for industrial work done or industrial services rendered to others (item 5.1.4)

+ Other revenues (item 5.2)

+ Value of own-account fixed assets (Item 5.3)

+ Change in work-in-progress (item 6.3.3)

+ Change in inventories of finished goods (item 6.4.3)

+ Change in inventories of goods purchased for resale in the same condition as received (item 6.5.3)

4.187 Although the measurement of the census value added has been recommended to be discontinued; it has been defined in the following paragraphs for the benefit of countries choosing to compile this measure for the sake of continuity.

4.188 Census output is calculated in the same manner as the gross output except that the "other revenue" (item 5.2) is excluded.

4.189 In order to maintain consistency with valuation principle for output (production) of other international recommendations on business statistics and national accounts, it is recommended that countries compile the output of industrial establishments at basic prices. However, in circumstances where it is not possible to segregate "taxes and subsidies on products" and "other taxes on production", valuation of output at factor cost can serve as second best alternative.

4.190 Depending upon the treatment applied to taxes and subsidies on production, countries may adopt one of the alternative valuations, namely, factor costs and basic prices. Countries are requested to state clearly the method of valuation adopted by them. For better understanding of different valuation methods the following relationships are important:

Value of gross output at factor costs

+ Other taxes on production (item 7.1.1)

- Other subsidies on production (item 7.2.2)

= Value of gross output at basic prices

## 9. Intermediate consumption and census input

### *Intermediate consumption at purchasers' prices (item 9.1)*

4.191 Intermediate consumption consists of the value of goods and services consumed as inputs in the process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital (depreciation (item 11.4)). The goods or services may be either transformed or used up in the production process. Intermediate consumption is normally valued at the purchaser's price prevailing at the time goods and services enter the process of production; that is, at the price the producer would have to pay to replace them at the time they are used.

4.192 Intermediate consumption is a national accounts concept. It is recorded at the time when the good or service enters the process of production, as distinct from the time it was purchased/acquired by the establishment. The two times coincide for services, but not for goods. In practice, units keep records of purchases of goods and services intended to be used as inputs and also of any changes in the amounts of such goods held in inventories. This calls for an adjustment of purchases of goods for changes in inventories.

4.193 Intermediate consumption can not be directly observed from the accounting records of industrial establishments. It is calculated from data items in the following groups: Purchases of goods and services (item 4.a)) and Inventories (item 6.2.3).

Intermediate consumption = Cost of raw materials and supplies except gas, fuels and electricity (item 4.1)

+ Cost of gas, fuel and electricity purchased (item 4.2)

+ Cost of water and sewerage services purchased (item 4.3)

+ Purchases of services except rentals (item 4.4)

+ Rental payments (item 4.6)

+ Changes in inventories of materials, fuels and supplies (item 6.2.3)

Where input is measured on a consumed basis, the stock adjustment is not necessary.

***Census input at purchasers' prices (item 9.2)***

4.194 The measurement of census input is not part of the present recommendations. It has been defined here for the benefit of those countries that choose to compile this aggregate for the sake of the continuity of the time series. This item is calculated in the same manner as intermediate consumption (see para. 4.193) with the exclusion of item 4.4.2, "cost of non-industrial services".

## 10. Value added

### 10. *Total value added and census value added at basic prices*

***Total value added at basic prices (item 10.1)***

4.195 Value added can not be directly observed from the accounting records of the units. It is derived as the difference between gross output or census output (item 8) and intermediate consumption or census input (item 9). The value added at basic prices is

calculated as the difference between the gross output at basic prices (item 8.1) and the intermediate consumption at purchasers' prices (item 9.1). The valuation of value added closely corresponds to the valuation of gross output (item 8.1). If the output is valued at basic prices then the valuation of value added is also at basic prices (the valuation of intermediate consumption is always at purchasers' prices).

Total value added at basic prices = gross output *at basic prices* (item 8.1)

– intermediate consumption *at purchasers' prices* (item 9.1)

Census value added at basic prices = census output *at basic prices* (item 8.2)

– census input *at purchasers' prices* (item 9.2)

4.196 In some circumstances, it will not be possible to segregate the taxes and subsidies on products and production. Therefore, this recommendation takes these specific country perspectives into account by allowing the measurement of value added at factor cost. Alternatively, the value added at factor cost is measured as:

Total value added at factor cost = gross output *at factor cost*
– intermediate consumption *at purchasers' prices* (item 9.1)

Census value added at factor cost = census output *at factor cost*

– census input *at purchasers' prices* (item 9.2)

4.197 Value added can be expressed in gross or net terms depending on the inclusion/exclusion of the consumption of fixed capital (depreciation).

4.198 The term "census value added" is used to indicate that the scope of the inquiry is limited to the content of the industrial statistics and that receipt and purchases of non-industrial nature have not been considered. As noted earlier, measurement of census value added has been discontinued in the present recommendations, only when countries would like to maintain their time series on census value added, they could opt for continuing its measurement.

## 11. Capital Formation

4.199 Gross fixed capital formation is measured by the total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain specified expenditure on services that adds to the value of non-produced assets.

***Gross fixed capital formation (item 11.1)***

4.200 The data should include the value of all durable goods expected to have a productive life of more than one year and intended for use by the establishment (land, mineral deposits, timber tracts and the like, buildings, machinery, equipment and vehicles). Included are major additions, alterations and improvements to existing fixed assets that extend their normal economic life or raise their productivity. Also included is the value of new fixed assets and additions and improvements to existing fixed assets made by the establishment's own labour for its own use. While capital repair is included, expenditures for current repair and maintenance are excluded. Transactions in respect of financial claims and intangible assets (such as rights to mineral deposits, copyrights and the like) are excluded.

4.201 As it is expedient to collect data separately for acquisitions (items 12.2) and disposals (items 12.3), these transactions are treated individually. The classification by type of fixed asset for which data are to be reported is set out in paragraph 4.212 below.

*Valuation*

4.202 Fixed assets acquired from others should be valued at purchasers' prices, which should cover all costs directly connected with the acquisition and installation of the items for use. These costs of ownership transfer comprise the cost of purchase of the fixed assets on the market including taxes and fees paid to government, transport, delivery and installation charges, direct preliminary outlays such as for site clearance and the fees of architects, designers and engineers, and all legal costs. Indirect outlays for purposes of financing the acquisition of the fixed assets, for example, flotation costs in respect of security issues such as underwriters' commissions and registration charges, service charges in respect of loans, and expenses of special advertising campaigns are excluded. Such expenses are treated as intermediate consumption. For countries using the value-added tax system, the deductible VAT should be excluded.

4.203 Fixed assets acquired through barter are valued at their estimated basic prices plus any taxes payable and costs of ownership transfer. In principle, fixed assets produced on own account should also be valued in this manner. However, as this may be impracticable, particularly in the case of the construction of structures and other works and alterations, it may frequently be necessary to resort to valuing such own-account production at explicit cost, including any imputations that may be required in respect of the employed own-account labour.

4.204 Fixed assets produced by one establishment of a multi-establishment enterprise for the use of another establishment of the same enterprise should be valued by the receiving establishment as though purchased from outside the enterprise.

4.205 Disposal of fixed assets should be valued at the actual amounts realized rather than at book values. It should be noted that only disposal should be deducted, and not decreases in inventories of fixed assets owing to other cause.

*Time of recording*

4.206 The general principle for the time of recording of acquisitions less disposals of fixed assets is when the ownership of the fixed assets is transferred to the unit that intends to use them in production. Except in two special cases, this time is not generally the same as the time at which the fixed assets are produced and put to use in the production of other goods or services.

4.207 The two exceptions cover assets that take some time to produce such as construction projects. In general, incomplete construction projects and immature animals and plantations are treated as work-in-progress. They are reclassified from inventories to fixed capital when complete and delivered to the unit intending to use them as fixed assets. However, when the assets are being produced on own account, the partially complete products are recorded as capital formation as work takes place. When the assets are developed under a contract of sale, the producer records work-in-progress as normal but when stage payments are made, these are regarded as purchase of [part of] a fixed asset or as a trade advance if the value of the stage payment exceeds the value of the work put in place. In the latter case, work is recorded as fixed capital delivered to the final owner as work proceeds until the trade credit is exhausted.

4.208 When there is no contract of sale agreed in advance, the output produced by the enterprise must be recorded as work-in-progress or as additions to the producers' inventories of finished goods, depending upon whether the product is completed. For example, finished dwellings built speculatively remain as additions to the producers' inventories of finished goods until they are sold or otherwise acquired by users.

4.209 The acquisition of fixed assets should, in principle, be recorded at the moment the establishment assumes economic ownership of the items in question. When machinery and equipment are bought in completed form, the purchasers usually acquire the legal title to the items when they contract for delivery of the goods in question. In the case of hire-purchase arrangements, it is desirable to consider the time of possession as the moment at which the buyer acquires economic ownership even though legal title passes at a much later date. When machinery and equipment are produced on order, the buyers are considered to take ownership of the goods at the time the items are completed. Progress payments made in respect of the orders should be treated as trade advances and not recorded as capital expenditure, although such payments may be entered in capital accounts. However, in the case of the construction on order of buildings, roads, dams and other works, the buyers are considered to take possession of any work that has been put in place on the project. Therefore, the expenditure to be reported in the case of construction work should be calculated as the total value of the work completed during the inquiry period, less the amount of any progress payments made against the work prior to the inquiry period, plus all progress payments made during the inquiry period against work not yet finished by the end of the period.

4.210 The definition outlined in the above paragraph treats progress payments for construction work and for other fixed assets differently. For construction work, progress

payments should be included in expenditure on fixed assets; for other fixed assets, progress payments should be excluded from expenditure on fixed assets and recorded as a financial claim from advance payments. In some countries, this treatment may not be feasible and all progress payments may have to be recorded as expenditure on fixed assets.

4.211 When establishments make fixed assets on their own account for own use, the value of the work put in place during the period should be classed as the gross fixed capital formation of the period.

### *Classification of fixed asset by type*

4.212 The transactions in fixed assets are divided into the following categories:

### *Dwellings (item 11.1.1)*

4.213 Dwellings are buildings that are used entirely or primarily as residences, including any associated structures, such as garages, and all permanent fixtures customarily installed in residences. Houseboats, barges, mobile homes and caravans used as principal residences of households are also included.

### *Other buildings and structures (item 11.1.2)*

4.214 Other buildings and structures comprise non-residential buildings, other structures and land improvements. These are described in turn below:

(a) *Non-residential buildings*: Non-residential buildings consist of buildings other than dwellings, including fixtures, facilities and equipment that are integral parts of the structures. For new buildings, costs of site clearance and preparation are included. Examples of non-residential buildings are warehouses and industrial buildings, and commercial buildings.

(b) *Other structures:* Other structures include structures other than buildings, including the cost of the streets, sewer, etc. The costs of site clearance and preparation are also included. Examples are shafts, tunnels and other structures associated with mining mineral and energy reserves, and the construction of sea walls, dykes flood barriers etc. intended to improve the quality and quantity of land adjacent to them.

(c) *Land improvements:* Land improvements are the result of actions that lead to major improvements in the quantity, quality or productivity of land, or prevent its deterioration, are also treated as fixed capital formation. Activities such as land clearance, land contouring, creation of wells and watering holes which are integral to the land in question are to be treated as resulting in land improvements. The value of natural land before

improvement is not included. However, the costs of ownership transfer on land improvements are included.

4.215 The major additions, alterations and improvements of buildings and structures (i.e. their renovation, reconstruction or enlargement) which prolong their service life or increase their productive capacity should be classified together with the acquisitions of new fixed assets of the same kind.

***Machinery and equipment (item 11.1.3)***

4.216 Machinery and equipment covers transport equipment, machinery for information communication and telecommunications (ICT) equipment, and other machinery and equipment. Tools that are relatively inexpensive and purchased at a relatively steady rate, such as hand tools, may be excluded. Also excluded are machinery and equipment integral to buildings that are included in dwellings and non-residential buildings.

***Transport equipment (item 11.1.3.1)***

4.217 Transport equipment consists of equipment for moving people and objects. This includes transport equipment, such as motor vehicles, trailers and semi-trailers; ships; railway and tramway locomotives and rolling stock; aircraft and spacecraft; and motorcycles, bicycles, etc.

***ICT equipment (item 11.1.3.2)***

4.218 The ICT equipment consists of devices using electronic controls and also the electronic components forming part of these devises. Examples are products within CPC Ver. 2 groups 452 and 471.

***Other machinery and equipment (item 11.1.3.3)***

4.219 Other machinery and equipment consists of machinery and equipment not elsewhere classified. Examples include general purpose machinery; special purpose machinery; office, accounting and computing equipment, electrical machinery and apparatus, radio, television and communication equipment and apparatus; and medical appliances, precision and optical instruments, watches and clocks etc.

***Intellectual property products (item 11.1.4)***

4.220 Intellectual property products are the result of research, development, investigation or innovation leading to knowledge that the developer can market or use to their own benefit in production because use of the knowledge is restricted by means of legal or other protection. Specific form of intellectual property products are research and development, mineral exploration and evaluation, computer software and databases, and entertainment, literary or artistic originals. Data requested in item 11.1.4, item 11.2.4, item 11.3.4, item 11.4.4, and item 11.5.4 presented in this publication are only for

illustration purposes, the actual questionnaire should distinguish between what business regards as their investment (e.g. actual acquisition) and the data that are needed for assessing own-account development of intellectual property products that are not capitalized by industries (e.g. imputation). Each component of intellectual property product should be divided into two components: Those that are investment goods procured from other enterprises and those that are developed on own-account or for own use. The latter can only approximated by cost of production which is equal to the sum of material and supplies costs, compensation of employees, other taxes on production, depreciation of the fixed assets used in production, and an imputed margin for overhead costs and profits if possible.

***Research and development (item 11.1.4.1)***

4.221 Research and experimental development (R&D) on own account consists of the value of expenditures on creative work undertaken on a systematic basis in order to devise new applications. By convention, output of own-account R&D production by enterprises is valued at the sum of costs, including the cost of unsuccessful R&D.

4.222 The sum-of-costs approach for R&D undertaken on own-account by enterprises is presented by the following identity

Output of own-account R&D = material and service costs

+ compensation of employees paid to R&D personnel

+ other taxes less subsidies on production

+ depreciation of capital goods used in R&D

4.223 The enterprise may not treat R&D as capital, but for statistical purpose, the data is requested separately as sum of costs. Sale at market value of the R&D reported as receipts in is the production of R&D for sale, which is different from R&D for own use recorded here.

***Mineral exploration and evaluation (item 11.1.4.2)***

4.224 Mineral exploration and evaluation consists of the value of expenditures on exploration for petroleum and natural gas and for non-petroleum deposits and subsequent evaluation of the discoveries made. These expenditures include pre-licence costs, licence and acquisition costs, appraisal costs and the costs of actual test drilling and boring, as well as the costs of aerial and other surveys, transportation costs, etc., incurred to make it possible to carry out the tests. Re-evaluations may take place after commercial exploitation of the reserve has started and the cost of these re-evaluations is also included in gross fixed capital formation. The expenditures incurred on exploration within a given accounting period, whether undertaken on own account or not, are treated as capital

expenditures included in the enterprise's gross fixed capital formation irrespective of the fact whether the exploration results in success or nor.

***Computer software and database (item 11.1.4.3)***

4.225 Computer software consists of computer programs, program descriptions and supporting materials for both systems and applications software. Gross fixed capital formation in computer software includes both the initial development and subsequent extensions of software as well as acquisition of copies that are classified as assets. Software purchased on the market is valued at purchasers' prices, while software developed in-house is valued at its estimated basic price or at its costs of production if it is not possible to estimate the basic price. The formula used to calculate output is similar to R&D. Note that besides the software purchased as capital goods, the cost of software development for internal own use is reported here as an estimate of production cost, calculated similarly to R&D. If the respondents cannot provide complete cost data, at least they should report the compensation of employees data (item 3.1.1.3).

4.226 A database consists of files of data organised in such a way as to permit resource-effective access and use of the data. The database consists of two parts, the database management system (DBMS) software and the data whose access is facilitated by the DBMS. The creation of a database will generally have to be estimated by a sum-of-costs approach. The cost of the DBMS used should not be included in the costs but be treated as a computer software asset. However, if the DBMS used has been acquired under an operating lease, then the rental payment for the same should be included in the cost. The cost of preparing data in the appropriate format is included in the cost of the database but not the cost of acquiring or producing the data initially. Other costs will include staff time estimated on the basis of the amount of time spent in developing the database, an estimate of the consumption of fixed capital of the assets used in developing the database and costs of items used as intermediate consumption. Note that besides the database purchased as capital good, the cost of database development for own use is reported here as an estimate of costs calculated similarly to R&D.

***Entertainment, literary and artistic originals (item 11.1.4.4)***

4.227 Entertainment, literary and artistic originals consist of the original films, sound recordings, manuscripts, tapes, models, etc., on which drama performances, radio and television programming, musical performances, sporting events, literary and artistic output, etc., are recorded or embodied. Such works are frequently developed on own-account which may be estimated by a sum-of-costs approach.

***Depreciation (item 11.4)***

4.228 Depreciation as calculated in business accounting is a method of allocating the costs of past expenditures on fixed assets over subsequent accounting periods Depreciation represents the loss in value of a fixed asset due to ageing and its use in production. It is mostly calculated on the basis of historic costs of fixed assets. Depreciation is not consumption of fixed capital, used by national accountants and

economists. Depreciation applies to all fixed assets; therefore classification of depreciation should correspond to the classification of fixed assets as presented in data item 11.1.

4.229 Depreciation in business accounting deviates from the concept of consumption of fixed capital employed in the economic accounting standards. Consumption of fixed capital is defined in general terms as that part of the gross product that is required to replace fixed capital used up in the process of production during the reference period. It is based on the concept of the expected economic lifetime of the individual assets, and it is designed to cover the loss in value owing to foreseen obsolescence and the normal amount of accidental damage that is not reparable, as well as normal wear and tear. Unforeseen obsolescence is treated as a capital loss at the time at which it actually occurs, rather than as fixed capital consumption. In principle, the scope of the capital equipment for which consumption should be recorded is given by the definition of fixed capital formation. Consumption of fixed capital will be calculated by national accountants for analytical purposes later, not at the stage of data collection.

**Optional characteristics**

4.230 Other characteristics may be of considerable interest at the national level, probably the most significant being the distinction between new and used fixed assets. The standard adopted for this distinction is given below.

4.231 New fixed assets include all those that have not been previously used in the country. Thus, newly imported fixed assets are considered new whether or not they were used before they were imported. Used fixed assets include all those that have been previously used within the country.

4.232 The distinction between new and used fixed assets was included in the 1968 recommendations and, for continuity, is also included in the present recommendations. It is classified as an optional item because it is considered to be primarily of national interest, although in some countries only new assets are recorded and used as an approximate measure of total gross fixed capital formation. At the establishment level, the distinction between new and used fixed assets may not be easily determined, and sometimes the recommended distinction is subject to different interpretations by national authorities. Caution, therefore, should be exercised when incorporating this characteristic into the inquiry.

4.233 Some countries are collecting expenditure on fixed assets under the categories "productive" and "social" investments. Social investments are defined as the costs of installations of a social character, that is, installations that are used by the staff or of benefit to the staff outside of working hours and that do not constitute any additional production capacity (canteens, sports arenas, rest rooms, dwellings for employees and so on). Where this information is desired, it could be fitted into the overall scheme as a subcategory of paragraph 4.213 and 4.214 above.

4.234 It may be of interest to measure the portion of fixed capital formation that is attributable to statutory regulations concerning protection of the environment, such as expenditures for pollution control or noise abatement. This is a relatively new development and guidelines have not yet been formulated. However, national statistical offices may wish to study the national regulations and the practices of industry with a view to establishing guidelines on how to measure the expenditures relating to the protection of the environment.

**Treatment of new establishments not yet in operation**

4.235 Gross fixed capital formation should normally be extended to cover establishments where production had not yet commenced during the reference period. As this may sometimes be impractical, the treatment of such establishments should be covered in the published results of the inquiry.

## 12. Orders

## 12. Orders

4.236 In selected branches of industry, the following information, at monthly or quarterly interval may be very useful in tracking the strength or weakness of investment and production in the economy.

***New orders received (item 12.1)***

4.237 This item is defined as the current value of all new orders received in the reference period.

***Unfilled orders at the end of the inquiry period (item 12.2)***

4.238 This item is defined as the current value of all orders outstanding at the end of the inquiry period. The value of unfilled orders at the beginning of the period plus the value of "new orders received" in the period, minus sales or shipments in the period, equals the value of unfilled orders at the end of the reference period.

## 13. Environmental protection

***Environmental protection expenditure (item 13)***

4.239 Environmental protection groups together all actions and activities that are aimed at the prevention, reduction and elimination of pollution as well as any other degradation

of the environment. This includes measures taken in order to restore the environment after it has been degraded due to the pressures from human activities.

4.240 This definition implies that to be included under environmental protection, actions and activities or parts thereof must satisfy the primary purpose criterion (*causa finalis*), i.e. that environmental protection is their prime objective. Actions and activities which have a favourable impact on the environment but which serve other goals do not come under environmental protection. Hence, excluded from the field of environmental protection are activities which, while beneficial to the environment, primarily satisfy technical needs or the internal requirements for hygiene or security of an enterprise or other institution.

4.241 Activities like water supply or the saving of energy or raw materials are regarded as the management of natural resources and are excluded from environmental protection. However, such activities are considered environmental protection activities to the extent that they mainly aim at environmental protection. An important example is recycling which is included to the extent that it constitutes a substitute for waste management.

4.242 Environmental protection expenditure consists of the total expenditures (current and capital) of an industry whose primary purpose is for the protection of the environment; that is the prevention, reduction and elimination of pollution as well as any other degradation of the environment. It consist of uses of environmental protection services (such as wastewater treatment), gross capital formation for environmental protection, uses of connected and adapted products and specific transfers which are not already captured in the categories above (such as investment grants, international aid, donations, taxes earmarked for environmental protection). Connected products are products whose use by resident units directly and exclusively serves an environmental protection objective but which are not environmental protection services produced by an environmental protection activity. Adapted (or 'cleaner') products are defined as products that meet the following criteria: (a) on the one hand, they are less polluting when consumed and/or disposed than equivalent normal products (equivalent normal products are products that provide similar utility, except for the impact on the environment); (b) on the other hand, they are more costly than equivalent normal products. Countries may refer to the *Environmental Protection Expenditure Accounts – Compilation Guide* (Eurostat 2002) for more details.

## D Data items for international reporting

4.243 Countries are encouraged to make available on their websites or to disseminate industrial statistics internationally as soon as they become available to national users.

## 1. *Data items for international reporting with annual periodicity*

4.244 The following table provides the list of data items on industrial statistics and their level of details recommended for international dissemination with annual periodicity.

**Table 4.2 List of data items on industrial statistics for international dissemination with annual periodicity**

| Data item | Level of details | Minimum reporting level (in terms of ISIC Rev. 4) | Time lag (after close of reference year) |
|---|---|---|---|
| **A. Demography** | | | |
| 1.10 Number of enterprises | Broken down by activity, size class | 3-digit level for activity breakdown<br>1-digit level for size class breakdown | 18 months |
| **B. Employment** | | | |
| 2.1 Total number of persons employed | Broken down by activity and size class | 3-digit level for activity breakdown<br>1-digit level for size class breakdown | 18 months |
| 2.1 Total number of employees | Broken down by activity and size class | 3-digit level activity breakdown<br>1-digit level for size class breakdown | 18 months |
| **C. Compensation of employees** | | | |
| 3.1 Wages and salaries in cash and in kind of employees | Broken down by economic activity | 3-digit level | 18 months |
| **H. Output** | | | |
| 8.1 Gross output (at basic prices) | Broken down by economic activity | 3-digit level | 18 months |
| **J. Value added** | | | |
| 10.1 Total value added (at basic prices) | Broken down by economic activity | 3-digit level | 18 months |
| **K. Gross fixed capital formation** | | | |
| Gross fixed capital formation | Broken down by economic activity | 1-digit level | 18 months |
| **M. Environment** | | | |
| 13.1 Environmental protection expenditure | Broken down by economic activity | 3-digit level | 18 months |

| Data item | Level of details | Minimum reporting level (in terms of ISIC Rev. 4) | Time lag (after close of reference year) |
|---|---|---|---|
| | | | |
| Q4.2.4 Total energy consumed (terajoules) | Broken down by economic activity | 3-digit level | 18 months |
| Q4.3.1.3 Total water used (cubic meters) | Broken down by economic activity | 3-digit level | 18 months |

4.245 For international comparability the information on these indicators should be provided annually covering the entire industrial activities in the economy.

## 2. *Data items for international reporting with quarterly periodicity*

4.246 The following table provides the list of data items on industrial statistics and their level of details recommended for international dissemination with quarterly periodicity.

**Table 4.3 List of variables for data for international dissemination with quarterly periodicity**

| Data item | Level of details | Minimum reporting level (in terms of ISIC Rev. 4) | Time lag (after close of reference quarter) |
|---|---|---|---|
| **B. Employment** | | | |
| 2.1 Total number of persons employed | Broken down by economic activity | 2-digit level | 3 months |
| 2.1.3 Total number of employees | Broken down by economic activity | 2-digit level | 3 months |
| **C. Compensation of employees** | | | |
| 3.1 Wages and salaries in cash and in kind of employees | Broken down by economic activity | 2-digit level | 3 months |
| **L. Orders** | | | |
| 12.1 New orders received | Broken down by economic activity | 2-digit level | 3 months |
| 12.2 Unfilled orders | Broken down by economic activity | 2-digit level | 3 months |
| **Index of Industrial production** | | | |
| Index of industrial production | Broken down by economic activity | 2-digit level | 3 months |

# PART II

# GUIDANCE FOR IMPLEMENTATION

# V. PERFORMANCE INDICATORS

## A. Performance indicators and their use

5.1 The increasing demand for a wide range of data for assessing businesses' strategic interests like, profitability, productivity and efficiency have led to intense interest in performance measures. Performance indicators make it possible to evaluate performance of producers units and to asses how well the industrial sector is performing in relation to other economic activities both in the national economy or internationally.

5.2 The information collected using the data items described in the previous chapter are useful in analyzing the performance of the producing unit but their direct use in policy or management decisions are rather limited. This chapter suggests the indicators for monitoring and measuring the overall performance of industrial sector as a whole or the performance of its divisions.

5.3 Given the diversity of users' needs and the fact that they may change over time, a definitive list of performance indicators that can be applied in all countries and in all circumstances is not possible to enumerate. Rather the approach taken in this document is to describe the objectives of performance indicators relating to industrial activities, the key principles on how they can be developed, best used and interpreted and to suggest a list with most commonly used performance indicators. The suggested list is a practical set of performance indicators and their definitions applicable to a broad range of units/activities.

## B. Objectives of performance indicators

5.4 In principle, a performance indicator is a policy relevant statistics that provides an indication about the conditions and functioning of any segment of the economy, including the industrial sector or its units. In practice a performance indicator can be any ratio that summarizes two or more important measurements and that is tied to the performance of a unit or a sector.

5.5 Performance indicators are also a powerful instrument to present complex information in a synthesized way. They are simplified means of summarizing and communicating the information to decision makers, policy analysts, researchers and the public.

5.6 As a tool for measuring the overall performance of industrial sector of the economy, the performance indicators help policy makers and economic planners to monitor and evaluate how effectively the industrial activity is organized, to identify potential areas of improvement and to make more informed strategic decisions regarding future strategy for development.

5.7 Performance indicators also help business community. By using them the businesses can quickly assess the business environment in which they operate. Performance indicators allow producers to develop their own performance measurement programmes, to identify and set their long term trends in performance and to measure their progress. Managing and reporting performance can lead to significant business benefits such as increased efficiency through reducing and managing the resources, increased production, and improved reputation among customers.

5.8 Every performance indicator, implicitly or explicitly, relates to a specific producer unit: an establishment, a firm, an industry, a sector or an entire economy. Performance indicators are also a suitable tool for academicians and researchers who use them for making comparisons across countries, industries and over time, and for identifying factors that lead to better performance.

## C. Types of performance indicators

5.9 The performance indicators can broadly be distinguished under three types, namely (a) growth rates, (b) ratio indicators and (c) share indicators. These indicators may be considered as part of the industrial statistics programme and calculated at the 3-digit (group) level of ISIC, Rev.4 for annual and at 2-digit (division) level of ISIC, Rev.4 for quarterly periodicity.

5.10 Most of performance indicators have a comparative dimension or a reference point that permits time series evaluation. Depending on the importance and data availability businesses can compile and track some of the indicators daily (for example total sales), while other users may study them monthly (inventories to sales ratios), quarterly or annually.

5.11 The performance indicators are best used to gauge the overall performance of the industrial sector (or any other sector of the economy), its structure or ongoing processes, therefore, it is recommended not to sacrifice this goal for the sake of a very detailed analysis and compilation of performance indicators of minor importance but requiring a lot of additional data. The purpose of performance indicators is to arrive at an understanding of the broad performance and trends of the industrial sector in a harmonized and internationally comparable manner.

5.12 The data items discussed in chapter IV allow compilation of indicators which are useful for measuring the overall performance of industrial sector of the economy. Though several indicators could possibly be compiled using information collected on the data items described in chapter IV, some common indicators are presented in the following paragraphs which are recommended to be compiled by countries:

## 1. *Growth rates*

(a) *Value added growth*

5.13 Annual (quarterly) percentage change of value added of industrial activity (or value added of any other economic activity) is the value added growth rate. It is expressed as (in terms of an arithmetic growth rate) as $(Y_t/Y_{t-1}) - 1$ where Y and t denote the value added and the time period respectively.

(b) *Industrial sector employment growth*

5.14 Employment growth in industrial activities is the annual (monthly or quarterly) percentage change of persons employed (data item 2.1) in industrial sector. This can be compiled by economic activities, by gender and by size classes of establishments.

## 2. *Ratio indicators*

(a) *Output per person employed*

5.15 Output per person employed is obtained by dividing the total output, as defined in (item 8.1), by the number of persons employed (item 2.1). It shows the time profile of how productively labour is used to generate output. This indicator is useful to trace the labour requirements per unit of output. It reflects the change in the input coefficient of labour by industry and can help in the analysis of the labour requirements by industry.

5.16 This indicator is easy to measure but has shortcomings as it is influenced by sourcing of the labour input and the shifting share of part-time employment in the workforce. For example, it rises as a consequence of outsourcing and also does not reflect a change in the individual characteristics of the workforce. One way to correct for part-time employment is to take into account the number of hours worked.

(b) *Output per hour worked*

5.17 Simple headcount of employed persons hides changes in average hours worked, caused by the evolution of part-time work or the effects of variations in the overtime, absence from work or shifts in standard hours. Labour input to the process of production is most appropriately measured as the total number of hours worked. Using the information on total hours worked, the output per hour worked, is obtained by dividing the total output (item 8.1) by total hours worked (item 2.5) to produce this output.

(c) *Value added per person employed*

5.18 This indicator is a ratio of the total value added (item 10.1) to the total number of persons employed (item 2.1). The value added per person employed is the popular method for estimating the trends in labour productivity for total economy and by economic activity.

(d) *Ratio of orders received to shipment*

5.19 This indicator is the ratio of the orders received (item 12) to the total shipment during the period (item 5a). This indictor is useful to monitor sub-annual trends. In selected branches of industry, information on orders might be collected in the infra-annual inquiries. The data on orders may be collected for the following two categories:

(i) *New orders received*: This item is defined as the current value of all new orders received during the reference period.

(c) *Unfilled orders at the end of the inquiry period*: This item is defined as the current value of all orders outstanding at the end of the inquiry period. The value of unfilled orders at the beginning of the period plus the value of "new orders received" in the period, minus sales or shipments during the period, equals the value of unfilled orders at the end of the period.

(e) *Inventories to shipment ratio*

5.20 The inventories to sales ratio is the relationship of the values of inventory (item 6) to the total shipment (item 5a) during the period. The ratio is more important as a short term indicator, although it may be calculated for any time period.

*(f) Intensity of energy consumption by activity*

5.21 This indicator measures the intensity of energy use in terms of quantity of energy consumed (measured in terajoules) per unit of value added and can be derived as the ratio of total energy consumed (item Q4.2.4) and total value added (item 10.1). Declining trends of the indicator indicate whether an industry improves its energy efficiency and, hence, decouples economic growth from energy consumption. Improving energy efficiency has beneficial effects on energy security and reduces pressures from economic activities on the environment.

*(g) Water use intensity by economic activity*

5.22 This indicator measures the intensity of water use in terms of volumes of water per unit of value added and can be derived as the ratio of quantity of total water used (in

cubic meters-item Q4.3.1.3) and total value added (item 10.1). It is an indicator of pressure of the economy on the water resources. Over time, it shows whether a country manages to decouple water use from economic growth. The indicator also provides information on progress in implementation of integrated water resources management plans. The indicator is defined as cubic metres of water used per unit of value added (in US dollars) by economic activity. Total water used by an economic activity consists of the sum of (a) quantity of water abstracted from the environment either permanently or temporarily for own use (item Q4.3.1.1) and (b) quantity of water purchased (item Q 4.3.1) minus (c) quantity of water sold (item Q 4.3.1.2) .

(h) *Ratio of environmental protection expenditure by value added*

5.23 As the name indicates, this indicator is computed as the ratio of environmental protection expenditure (item 13) incurred by the producing unit to the value added generated (item 10.1) during the reference period. This indicator measures the efforts of an industry for the protection of the environment.

## 3. *Share indicators*

(a) *Share of industrial activity value added in total value added*

5.24 This indicator refers to the proportion of value added generated on account of industrial activity (or any other economic activity) to total value added of the economy. When this indicator is calculated for all economic activities, it depicts the structural composition of the economy and shows contribution of individual economic activities to the GDP.

(b) *Share of industrial activity employment in the total employment*

5.25 This indicator serves as a useful tool for assessing the segmentation and trends in labour market. It is calculated as a ratio between the total number of persons employed in industrial activities (or any other economic activity) to the total number of persons employed in the total economy.

# VI. DATA SOURCES AND DATA COMPILATION METHODS

## A. Data sources

6.1 To produce the required data outputs, a statistical office collects and transforms basic data from the institutional units – corporations, government units, households and non-profit institutions serving households – in their roles as producers, consumers and investors, income earners, etc. There are two basic mechanisms for collecting economic data: (a) access to data already being collected for administrative purposes, and (b) direct survey by the statistical office. In either case, however, the original providers of the data are the same, namely the institutional units, and the original sources of the data are the same, namely the records kept by these units.

### 1. *Administrative sources*

6.2 Administrative processes are set up in response to legislation and regulation. Each regulation (or related group of regulations) results in a register of the institutional units – enterprises, persons, etc. – bound by that regulation and in data resulting from application of the regulation. The register and data are referred to collectively by the statistical office as an *administrative source*. The administrative authorities keep records of the units in response to legislated administrative requirements or simply for internal purposes to assist the units in managing their operations. The data emanating from the administrative source can be used by the statistical offices.

6.3 The merits and limitations of the administrative records as the source for data collection are described below:

*Main advantages of the administrative source*

(a) Complete coverage of the population to which the administrative process applies and perceived to have negligible non-response;

(b) Avoidance of response burden: the responding units make available the information as part of the administrative procedure;

(c) Cheaper for the statistical office to acquire data from an administrative source than to conduct a survey (though in some cases processing of the same may be costlier);

(d) No sampling errors; and

(e) Data reported may be more accurate because of intense data checks by administrative authorities.

*Main disadvantages of the administrative source*

(a) Discrepancy between administrative concepts and statistical concepts: As the administrative processes are not under statistical office control concepts regarding variables and units in respect of data coverage, content, quality and consistency comply to the administrative objectives. This limits the use of administrative data for statistical estimation and analysis purposes;

(b) Poor integration with other data of the statistical systems. This is in particular a problem when administrative units do not correspond to statistical units either because of difference in the concept or because of deviating identification numbers. Even if the variables existing in the administrative register perfectly fit to the needs of the statistical office, matching problem can prevent from using them;

(c) Risks with respect to stability: Administrative processes are subject to change in response to new legislation without much (or any) regard for the impact on the statistical series. This may cause systematic bias;

(d) Even when the administrative authorities check data, they generally focus on the variables that are material to their administrative processes. They may not apply the same level of scrutiny to variables that are of statistical interest;

(e) Data may become available with unacceptable delay; and

(f) Legal constraints with respect to access and confidentiality.

6.4 Administrative source as an alternative source for data collection can not be ignored. This can be of a great help in reducing significantly the response burden and the surveying costs. The relative advantages and disadvantages mentioned above have no absolute value. It depends on the specific situation whether they apply and to what extent. Therefore, the review has to be seen as a checklist which can be used in the process of decision making.

6.5 In order to make data from administrative more useful to statisticians, it is necessary to have a harmonisation in concepts and classification system among different types of statistics. To achieve this, it is important that statisticians of different branches of the government should coordinate works in setting national statistical standards. Many countries have done this quite well, for example, France's business financial statements have been prepared since 1947 with the participation of French national statistical office and the Ministry of Finance to serve both tax collection and statistical purposes (Augeraud and Chapron 2000).

6.6 For industrial statistics, the government administrative source is the basic source for production and financial statistics on public enterprises and public quasi-corporations.

In addition, government administrative sources such as tax records could be the basic source for production and financial statistics for national private, foreign controlled enterprises and household enterprises.

*Privately controlled administrative data sources*

6.7 Besides the administrative data sources set up in response to legislation and/or regulation, statistical offices may obtain certain data from the private sector data suppliers[1]. Private sector data suppliers operate on a commercial basis so the transfer of data from them to the statistical offices takes the form of a contract with a payment of a fee. The data collected by private sector data suppliers can serve as an important supplement to the official statistics. Such data, however, should be carefully examined for its scope and coverage and considered for use only when found to be of acceptable quality.

## 2. *Statistical surveys*

6.8 Administrative data alone is not sufficient for the analysis of the industrial activities in the economy. Alternatively, the required information can also be collected by the statistical office directly from the units concerned. This could be done either by enumerating all the units in the population (census) or eliciting response only from few representative units scientifically selected from the population (sample survey).

6.9 Both, the census and the sample survey techniques are used for collecting industrial statistics. The census approach, which covers the whole of population of statistical units in a subject matter, is obviously a time consuming and the resource intensive exercise and is generally used to generate industrial statistics with lower frequency i.e. those required at longer interval of time. The sample survey technique on the other hand is less costly way of data collection for generating industrial statistics with required degree of precision with high frequency of shorter intervals. In reality, even in countries that use the census approach, it is applied only to a segment of industrial statistics, for example the population of all corporations that are large, the rest are covered by sample surveys. Whatever the approach, it is important to have a register of all statistical units.

6.10 The weaknesses inherent in the administrative data in respects of concept and coverage of the statistical units and the target population are overcome in adopting the sample survey as the means for data collection because the planning, execution of the sample surveys, data collection and the processing procedures are under the control of the statistical office.

6.11 Besides these advantages, the survey approach has disadvantages also that these are resource intensive (both financial and manpower), additional respondent burden,

[1] An example of a private sector data supplier is Dun and Bradstreet in the United Kingdom.

higher non-response rates and sampling errors. Another problem is that in practice respondents may not trust the confidentiality clause.

6.12 Two types of surveys may be appropriate for collecting data for an industrial enquiry depending on the units sampled and/or contacted, namely *enterprise surveys*; and *mixed household-enterprise surveys*. Choice of the type of survey to be conducted for an industrial enquiry depends upon the statistical system of a country and the resources available to its statistical office.

6.13 *Enterprise surveys* are those in which the sampling units comprise enterprises (or statistical units belonging to these enterprises), the reporting units from which data are obtained, and the observation units about which data are obtained. In a mixed household-enterprise survey, a sample of households is selected and each household is asked whether any of its members own and operate an unincorporated enterprise. The list of enterprises thus compiled is used as the basis for selecting the enterprises from which desired data are finally collected. Mixed household-enterprise surveys are useful to cover only unincorporated (or household) enterprises which are numerous and cannot be easily registered.

6.14 Availability of a sampling frame of the statistical units is a prerequisite for conducting the survey as it provides a basis for selection of sample units. Depending upon the source of the sampling frame, surveys may also be classified as either *list-based* or *area-based*. In a list-based survey, the initial sample is selected from a pre-existing list of enterprises, in an area-based survey; on the other hand, the initial sampling units are a set of geographical areas. After one or more stages of selection, a sample of areas is identified within which enterprises or households are listed. From this list, the sample is selected and data collected.

6.15 Countries will have flexibility to choose the data sources most suitable to them depending upon the practices their statistical system supports and the available resources. Minimizing the respondent burden should be an important objective for the national statistical offices when industrial surveys are designed and conducted.

6.16 Each type of survey has its own particular characteristics and appropriate uses, as described in the following paragraphs.

(a) *Enterprise surveys*

6.17 Enterprise surveys presuppose the availability of a sampling frame of enterprises. The sampling frame of enterprises engaged in the relevant economic activities is made available from the business register if such a register is maintained by the statistical office to support a range of surveys. For countries not maintaining a current up-to-date business register, the list of enterprises drawn from economic census conducted in the past may be used as sampling frame. In an area-based enterprise survey, a sample of areas is selected first, and then selected areas are enumerated for compiling the list of enterprises

operating in the area which serves as the sampling frame for selection of the enterprises in the sample to collect the requisite information. List-based enterprise surveys are generally preferred to area-based surveys for the following reasons:

(a) A list-based survey is more efficient from a sampling perspective. Because the area-based approach involves cluster sampling, a larger sample is required to achieve a given level of precision than in the case of list-based survey.

(b) It may be difficult to enumerate the enterprises within an area. While many enterprises are likely to be readily identifiable, household-based enterprises that carry out their work within the household or do not have a fixed location are usually difficult to identify.

(c) Maintenance of a list of enterprises via a general-purpose business register is cheaper than maintenance of an area-based list;

(d) Area-based sampling is inappropriate for large or medium-sized enterprises that operate in several areas because of the difficulty of collecting data from just those parts of the enterprises that lie within the areas actually selected. Furthermore, in order to avoid inadvertently missing parts of the enterprise, it is usually considered preferable to collect data from the whole of an enterprise not just a part of it.

6.18 Area-based enterprise survey approach is used for collection of data from small and micro enterprises generally operating in informal or unorganized segment of the economy. For such enterprises a satisfactory list is normally not available.

(b) *Mixed household-enterprise surveys*

6.19 In the mixed household enterprise surveys the sampled units and initial reporting units are households but the final observation units are enterprises. In a mixed household-enterprise survey, a sample of households is selected and each household is asked whether any of its members is an *entrepreneur, i.e.,* the sole proprietor of, or a partner in, an unincorporated enterprise. Data for all the enterprises thereby identified (or for a sub-sample of them) are then collected – either immediately from the respondent reporting on behalf of the enterprise or in a subsequent stage of data collection. Thus, the feature of a mixed household-enterprise survey that distinguishes it from a household survey is that it collects information about enterprises *per se*, whereas a household survey collects information about the persons in a household, including possibly their personal contributions to enterprises.

6.20 The efficiency of the mixed household-enterprise can be increased by making use of the information on the characteristics of the households collected at the listing stage and also the concentration of the own-account workers and employers by broad industry groups, in stratification of the enterprises to be selected for the data collection.

6.21 Mixed household-enterprise surveys can provide coverage of small and micro enterprises that are not included in list-based enterprise surveys. However, they suffer from similar disadvantages to area-based enterprise surveys, namely:

(i) A household listing approach often falls short of ensuring complete coverage of activities conducted in identifiable establishments outside the home of the business owner.

(ii) Difficulty of handling enterprises with production units at more than one location. Most often, a business is found to be located in an area unit that is different (and far away) from the area unit where the owner's household is located. The field workers in such cases have to rely on proxy reporting for filling the survey questionnaires.

6.22 In addition, an enterprise that is a partnership may be reported by each of its partners residing in different households. The duplication of coverage that this implies has to be allowed for in the survey estimation system. This is the feature that distinguishes a mixed household enterprise survey from an area-based enterprise survey, as, in the latter case, enterprises are directly identified and listed with due account of multi-establishment relationship. The process of producing list-frame and complementary enterprise-establishment area-frame is the reason why area-based enterprise enquiries are generally more expensive than mixed household-enterprise surveys.

6.23 To avoid these limitations of the mixed household-enterprise survey approach, some countries (e.g. India since late 1970s and Philippines) adopt a modified version of the approach (*Modified mixed household-enterprise surveys approach)*, which involve a dual, mutually exclusive, listing of (i) households and household-based business operators and (ii) establishments in the sample areas. At the listing stage, each structure of the selected area units is visited to identify and prepare a complete list of all establishments falling in the domain of the survey.

6.24 Modified mixed household-enterprise surveys approach is preferred to an area-based enterprise survey as it improves the quality of data of micro and small units specially the mobile units as compared with those with fixed location.

## B. Data compilation methods

### 1. *Data validation and editing*

6.25 Like any other survey respondent, an industrial statistics respondent is prone to commit errors while completing a statistical questionnaire. Thus, data collected in best of establishment/enterprise surveys are affected by response and non-response errors of different kinds. To resolve these problems of missing, invalid or inconsistent responses,

editing and imputation have become an integral part of all establishment/enterprise surveys data processing operations. Editing is the systematic examination of data collected from respondents for the purpose of identifying and eventually modifying the inadmissible, inconsistent and highly questionable or improbable values, according to predetermined rules. It is an essential process for assuring quality of the collected data. Micro editing (also called input editing) focuses on the individual record or questionnaire, as opposed to macro editing where checks are performed on aggregated data.

6.26 Poorly phrased questions in questionnaire are one of the main sources for respondent errors. It is better therefore, to spend effort in eliminating poorly phrased questions in a questionnaire than in trying to correct by editing the wrong responses received as a result of the poor questions. After developing a questionnaire, it should be tested before using in the industrial surveys for data collection.

6.27 Selective (significance) editing is an approach for prioritizing and further reducing costs of editing, which is one of the most resource-consuming processes in the production of official statistics. It is a procedure which targets only those of the micro data items or records that would have a significant impact on the industrial surveys results.

6.28 The data editing may take place during (input editing) or after the data entry (output editing). The following edit checks may be useful for detecting errors in the data:

(i) *Routine checks* - are used to test whether all questions which should have been answered in fact do have been answered;

(ii) *Valid value checks*, range checks are used to test whether answers are permissible. Response to a particular data item in the questionnaire is checked against a valid value range specified for the purpose. Any observation lying outside the valid value range may be an 'outlier'. In an industrial survey the valid value range often has to be very wide because of the varying size of the statistical units.

(iii) *Rational checks* - set of checks based on the statistical analysis of respondent data. Many checks take form of a ratio between two variables, which should be within specified limits. Another type of rational check is the arithmetic check, for instance specifying that a sum of variables should equal a total.

6.29 Large random errors by respondents can usually be picked up through plausibility checks on the data, for example by comparing the data reported with previous values, or the ratios of data reported with reasonable bounds for the types of enterprise. Not all errors committed by respondents can be traced by the statistical agency and therefore even exhaustive data editing will never result in error-free data file. For example, sustained systematic errors, such as underreporting of production and over reporting of costs by producer units can hardly be detected.

6.30 Responses for some particular data items have most significant impact upon the main estimates. These are often termed as *influential observations.* Editing effort should generally be more focused on such data item responses. In particular, very large enterprises are usually a source of influential observations and their data should be individually checked.

6.31 Some times information on some variables of interest may be available from other sources also which should be used for validation of data obtained from industrial surveys. Confrontation of data from different surveys may be helpful to reveal discrepancies or inconsistency between them. For such an exercise it is a prerequisite that all surveys should be carried out within a conceptually consistent framework for all business statistics, using standardized variables and classifications.

## 2. *Imputations*

6.32 Missing data is often encountered in most of the surveys which creates problems for the data editing. The data may either be missing for a particular data item of the questionnaire (item non-response) or the selected unit may not return the filled-in questionnaire at all (unit non-response). The technique of imputation is used for estimating the missing data in case of item non-response. The problem of unit non-response is usually dealt with by re-weighting.

6.33 Item non-response or partial non-response occurs when the sampled unit has not answered all relevant questions, but did respond to only part of them. Cases may arise wherein a respondent has reported on all questions but either some of the answers may not be logically correct or there may be inconsistencies between some of the answers provided by a respondent. Presence of such item non-response and invalid data in the data set ultimately affect the quality of the survey results. Much of these are removed by following appropriate editing rules. But, while detecting such cases of response errors during the editing process, one or more items are deleted, resulting in additional cases of "missing values" or "item non-response".

6.34 Presence of non-response requires that steps should be taken to reduce its effect on the estimates. There are two general strategies to deal with missing data item (non-response):

(a) Ignore all forms with missing values and confine to analysis of the fully completed forms, or

(b) Missing data are estimated so that the data matrix is complete. This is called imputation. Statistical analysis techniques are applied on the full data set completed with the help of imputation.

6.35 Adopting the first strategy leads to discarding even the valid data contained in the partially complete forms. Thus, it is desirable to adopt the second strategy to deal with the item non-response. The values of individual data items that are missing from the original response or believed to be in error should not be automatically interpreted as zeroes. When all of the data have been edited using the predetermined rules and the file is found to have missing data, then imputation is usually done as a separate step. It takes care of inconsistencies that remain unresolved in the earlier stages of manual and computer-aided scrutiny.

6.36 Imputation consists in replacing one or more erroneous responses or non-responses in a record or more than one record with plausible and internally consistent values. It is the process of filling the gaps and eliminating inconsistencies and the means of producing a complete and consistent file containing imputed data. There is a variety of methods for imputation, ranging from simple and intuitive to rather complicated statistical procedures. Some of the commonly used methods are mentioned below:

*(a)* *Subjective treatment*: impute on the basis of values which appear reasonable. For example, one might deduce the labour costs if the number of employees are known;

*(b)* *Mean/modal value imputation*: impute the mean value of a variable for missing data. For categorical data impute the modal value. An improvement may be to impute the median in order to eliminate the effect of outliers;

*(c)* *Post stratification*: More precision may be achieved in keeping the imputed value closer to the true value if the mean, mode or median are imputed using the observations from those units which are homogeneous with the one with missing data. For this purpose, post stratification is used – divide the sample into strata and then impute stratum mean, mode or median;

*(d)* *Substitution:* Relies on the availability of comparable data. Imputed data can be the value for the enterprise from the same survey occasion in the previous year, adjusted to reflect the average increase (decrease) of the data item in the stratum;

*(e)* *Cold deck:* Makes use of a fixed set of values, which covers all of the data items. Values can be constructed with the use of historical data, subject-matter expertise, etc. A 'perfect' questionnaire is created in order to answer complete or partial imputation requirements;

*(f)* *Hot deck:* The term hot deck is used to describe a family of imputation methods widely used in survey practice. A hot deck method is generally one in which each missing value is replaced by the available value from a 'donor', i.e. a similar participant in the same survey. The donor can be randomly selected from a pool of donors with the same set of predetermined characteristics. A list of possible donors matching these criteria is created

and one of them is randomly selected. Once a donor is found, the donor response (for example, the yearly income) replaces the corresponding missing or invalid response;

(g) *Nearest-neighbour imputation or distance function matching:* The donor can also be found through a method called *nearest neighbour imputation* that assigns an item value for a failed edit record from a "nearest" passed edit record. In this case, the "nearest" is defined using a distance function in terms of other known variables. The closest unit to the missing value is then used as the donor;

(h) *Sequential hot deck imputation:* This method also uses classes and requires single pass. The values from passed edit records are stored and the missing value is replaced by a function of the stored values. It begins with a cold deck value. The main disadvantage of this method is that it often leads to multiple uses of donors, thus affecting the distribution;

(i) *Regression (model based) imputation*: A set of predictor variables of the passed records are used to regress the variable. The regression equation is then used to impute the values for the mission or inconsistent item values.

6.37 There are other more advanced techniques of imputation like *Fellegi-Holt edit and imputation method* (Fellegi *at al* 1976) which performs all edits concurrently. The Fellegi-Holt method has the virtues that the logical consistency of the entire set of edit rules can be checked and that, in one pass through the data, an edit-failed and imputed record can be assured to satisfy all edits.

6.38 All these produce a single imputed value for each missing or inconsistent value. But these are prone to lead to inappropriate variance estimates when standard variance estimates are used. The extent of distortion varies considerably, depending on the amount of imputation and the method used. The *multiple imputation method* (Rubin 1987), addresses this problem by imputing several (m) times for each missing or inconsistent value requiring imputation. Then, from the completed data set, m estimates can be produced for the item. From these, a single combined estimate is produced along with a pooled variance estimate. A disadvantage of the multiple imputation method is that it requires more work for data processing and computation of estimates.

6.39 The choice of methods for imputation depends on the objective of the analysis and on the type of missing data. No method is superior to others in all circumstances. In most imputation systems, a mix of imputation method is used. The following are the desirable properties of all imputation programs:

(a) The imputed records should closely resemble the failed edit record, retaining as much respondent data as possible. Thus, a minimum number of variable (or fields) should be imputed.

(b) The imputed records should satisfy all edit checks.

(c) It is desirable to flag the imputed values and identify the methods and sources of imputation.

6.40 As for unit non-response, there are ways to minimise it by promoting awareness of the importance of the data to be collected; appealing to the respondents through the print and electronic media at the launch of the survey, to cooperate with the statistical authorities; issuing reminders to the non-respondents; and resorting to the enforcement measures laid down in the national legislation.

6.41 In many countries, at least for certain segments of the economy, the units selected in the sample are legally required to provide response to the survey conducted by the national statistical offices and are liable to be penalised in case of a non-response. But this does not eliminate the problem of unit non-response. The unit non-response may occur for one reason or the other, namely, non existence of the unit included in the survey, lack of appreciation of the importance of the data on part of the respondent, refusal, not knowing how to respond, lack of resources and non-availability of the desired information.

6.42 The case where no response to the questionnaire is received from the respondent, referred to as unit non-response, is usually dealt with by re-weighting the sample to include only the responding sampling units. It is common practice for the statistical office to attach weights to the elements in the sample. These weights are used, amongst other things, to expansion of the sample information to the level of target population. Alternatively, the problem of unit non-response can also be dealt with approaches similar to those used for item non-response, namely imputing either from the information for the previous periods available for that unit (substitution), or on the basis of the available administrative information for it.

### 3. *Grossing up procedures, aggregation*

6.43 After the data have been validated, edited and imputations have corrected for the non-response the data is used to estimate the level of the variable. The grossing up comprises raising the sample value with a factor based on the sampling fraction (or the factor using returned data) for each cell in the stratified sample for obtaining the levels of data for the frame population. The grossing up should use edited data to calculate a value representative of all units. In case information on auxiliary variable related to the variable under study are available for units in the sample as well as in the sampling frame, more sophisticated statistical techniques can be used for using this information for grossing up.

6.44 Outlier values should be identified and handled carefully as it may affect the estimates significantly. Outliers are a particular category of influential observations which are correct but are unusual in the sense that they do not represent the sampled

population and hence will tend to distort the estimates. If the grossing up factor is large and outlier value is included in the sample, the final estimate will be substantially large and unrepresentative as it is driven by one extreme value. The simplest way to deal with the outlier is to reduce its weight in the sample so that it represents itself only. Alternatively, statistical techniques can be used to calculate more appropriate weight for the outlier unit.

# VII. DATA COLLECTION STRATEGY

7.1 The aim of the industrial statistics programme is to obtain comprehensive and accurate statistical information on the industrial activity in the economy. This information may be obtained either through the statistical surveys or through institutional links with the data sets available elsewhere - administrative sources. Generally the mix of the two approaches is used for collection of industrial statistics. The extent of the use of one over the other depends upon the statistical system of a particular country. Countries with developed statistical system make progressively more use of administrative sources for coverage of the industrial activities.

7.2 A sample survey normally provides an efficient method for obtaining statistical information from large populations without the enormous costs and large human resource requirements of census-type enumerations. However, sample surveys always assume the existence of a known universe in terms of sampling frame, be it a statistical business register or area-frame.

7.3 The statistical business register is an essential tool for data collection. A statistical business register is a register of enterprises or establishments engaged in production of goods and/or services. The enterprises in the statistical business register have identifiable links to their establishments and classified by economic activity. In section A, the business register or statistical frame has been described.

7.4 In countries with less advanced statistical systems, the statistical business register is incomplete because their micro and small enterprises are not included in the register given the sheer number of enterprises in this segment of the total universe of enterprises. Section B presents a specific data collection strategy to complement the statistical business register.

## A. Business Register as a statistical frame for industrial inquiries

7.5 A list of all economic units in the survey target population is known as sampling frame which is used for conducting sample surveys for data collection. The sampling frame should include all accurate and up to date data items associated with units that are required for stratification, sample selection and contact purposes, for example, industrial, geographical, size codes, name, address and description of the unit, telephone and preferably a contact name.

7.6 The frame for a survey should contain all the units, without omission or duplication, that are in the survey target population and that contribute to the gross domestic product (GDP) of the national economy. This may not always be possible in practice, often for cost reasons, to cover all micro and small units, so some sort of cut-off

is usually applied in practice. The proportion of the GDP covered by the units in the frame is often more useful measure for cut-off than the proportion of units covered. With the present recommendation to cover the industrial sector of the economy as a whole, the statistical register should be complemented by an area frame to cover the enterprises not included in the register (see Section B)

## 1. *Purpose of Business Register*

7.7 The business register is an important statistical tool that besides providing the sampling frame for conducting the sample survey for collection of data also provides basis for grossing-up results from sample surveys to produce business population estimates. A business register of good quality will help to improve the efficiency of the national statistical system, which in turn shall help to reduce response burden on the businesses. A business register can open the possibilities of electronic data interchange for statistical work, such as transfer of data on a regular basis between national statistical offices, business and other national organisations.

7.8 It is recommended that the frame for every list-based enterprise survey for industrial inquiry should be derived from a single general purpose, business register maintained by the statistical office, rather than the option of using stand-alone registers for each individual survey. There are two basic reasons for using a single business register. First, and most importantly, the business register operationalises the selected model of statistical units and facilitates classification of units according to the agreed conceptual standards for all surveys. If survey frames are independently created and maintained, there is no means of guaranteeing that the surveys are properly coordinated with respect to the coverage they provide. Second, it is more efficient for a single organisational unit within the national statistical office to be responsible for frame maintenance than for each survey unit to create the frames for each of its surveys.

7.9 In case of existing business register, the statistical units may be assigned a unique identification code (para 3.3) which may provide the necessary information for identifying the enterprise to which the establishment belongs and vice-versa. In addition, the business register may also store the name of the owner enterprise and the address of its central office and other establishments. However, there may not be such information in some countries. In the absence of a business register, the link between the enterprise and establishments belonging to it may be ensured by matching their names and addresses. The central office of the legal entity, or the establishment itself, might be asked whether the firm is owned or controlled by another legal entity and, if so, the name and address of the central office of that legal entity may be requested. For practical purposes, it is also useful to request from the central offices a list of subsidiary legal entities and establishments.

## 2. *Creation and Maintenance of Business Register*

7.10 The size and scope of statistical business registers make it unlikely that they can be satisfactorily compiled and maintained solely by survey and the stand-alone efforts of the national statistical office. There are different sources for setting up a statistical business register. Each source must be examined carefully before being used and care taken to overcome the shortcomings. At the same time, it may be necessary to sacrifice some degree of completeness or accuracy in order to keep the costs of setting up the register at a reasonable level, but such decision should be made consciously and some attempt made to measure and describe the deficiencies.

7.11 To keep the coverage of the business register as representative as possible, it should contain current information on its constituents. This means the register should to be maintained over time to take note of the changes in the enterprise dynamics. For example, the ongoing enterprise may merge, split up or go out of business; change production activities, or move location while new enterprises may be created (*births*) and existing enterprises may cease to exist (*deaths*). Unless the business register is regularly maintained, it will quickly loose its value as it becomes dated and ceases to adequately reflect the real world. The following are some of sources for creating and maintaining a statistical register of business units:

(a) *Economic Census*

7.12 Economic or establishment censuses can normally provide the most comprehensive set of small area data for establishing the frame of the universe. Notwithstanding, the strength of the census instrument, this is generally a resource intensive exercise and requires large inputs of manpower and time. This tends to limit them to a low frequency such as once in five years. However, especially when a country is initiating an economic statistics programme, it is undoubtedly the most useful. Trained field enumerators can seek out each physically recognisable place of business and collect the necessary information by direct interview and observation. Aside the high cost, this approach will not document the non-recognisable places of business and enterprises without fixed location;

(b) *Administrative data source*

7.13 The sources of administrative data available to create and maintain a business register population will vary by country. Common examples of administrative data sources that may be used to create and support business registers include business registration systems, VAT tax systems, payroll tax systems, and records maintained by the Government for the administration of unemployment insurance, social security or other Government programmes. Such records however, need careful review to determine their completeness, suitability and accuracy; they are not designed primarily to serve economic survey needs. The administrative data source usually provides a list of legal entities, or some breakdown of these entities, to suit the administrative purpose for which it is designed. Typically it does not provide a list of enterprises broken down into

establishments (or other statistical units) according to the statistical office units model and classified by activity.

7.14 The same administrative sources which were used to create the business register, for example, business registration systems, VAT tax systems, payroll tax systems etc may also be used for maintenance of the register. The source data may be used to update the business register on the same cycle as the administrative data. For example, business tax data processes will often have a quarterly cycle, so tax information can be used to update the business register quarterly after the tax cycle is completed. Likewise, business registration/license systems often have an annual cycle.

7.15 Although there are many good reasons for using administrative sources, there is also number of problems associate with it, depending on the administrative source, for example the administrative registration are known to containing inactive units. Thus, it is vital to make use of any information from administrative sources that can indicate whether the enterprise is active or not. For example, if the administrative source contains information about enterprises required to make payroll deductions on behalf of employees, then the date of the last recorded deduction and the total size of the deductions over the preceding year and a half are good indicators of enterprise activity. No deductions suggest that the enterprise is inactive, at least as an employer. This information can be used to reduce the number of inactive enterprises.

(c) *Feedback from enterprise surveys*

7.16 Feedback from enterprise surveys is a vital source for creating and updating the business register as it provides new information on contact address changes, closure of business, change in the economic activity of the unit, etc.

(d) *Statistical business register surveys*

7.17 Register updating information that cannot be obtained from the administrative source on which the register is based, or from survey feedback, has to be obtained by *business register surveys* (sometimes termed *nature of business surveys*) and profiling operations conducted by business register staff.

(e) *Industry associations*

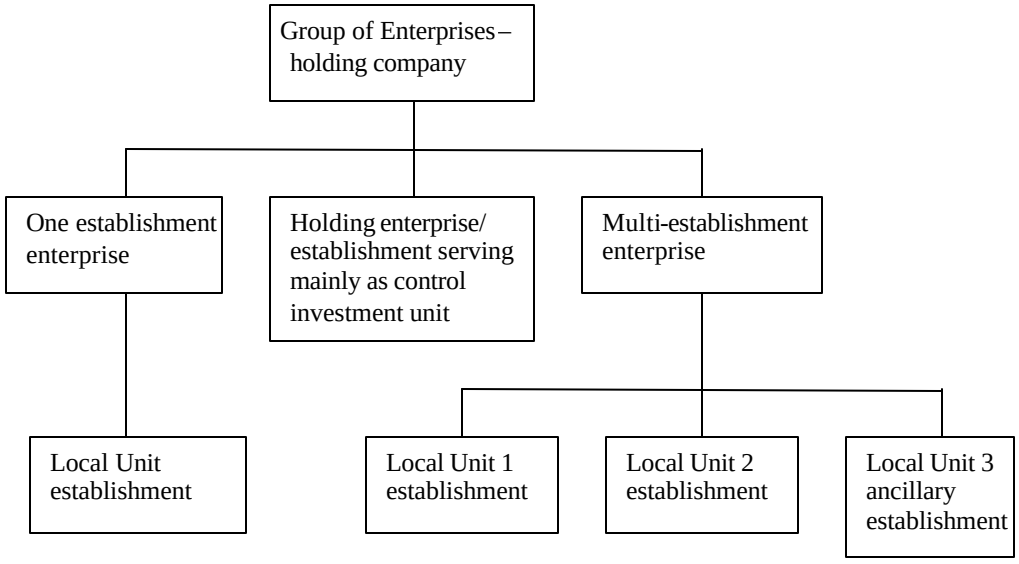
7.18 The information maintained by industry associations about their members may also be used as primary source for creating the business register.

(f) *Other potential sources*

7.19 These include telephone directories or special listings prepared by telephone companies. Each type has its own special characteristics which must be studied carefully before a decision is made on how to use it.

7.20 In general, the register is set up using one record for each establishment and one record for each enterprise with the link identifiable between each establishment and its parent enterprise. For multi-establishment enterprises, this means that there will also be a record for the central office, and each establishment should be cross-referenced to the central office. A separate record for each establishment permits maximum flexibility and easy identification of records for establishments going out of business. The register of establishments serves as the main frame for collecting data on production. Thus, proper codes should be assigned to the enterprises and establishments so as to establish hierarchical link between them as shown below. The coding of relationship would allow for the allocation of the operating surplus of the main establishment to its supporting ancillary units and the imputation of the outputs of ancillary units as intermediate consumption to consuming establishments. Holding companies are not ancillary units; the functions they perform to control and direct subsidiary companies are not ancillary activities. The 1993 SNA treats holding companies as "other financial institutions". A typical hierarchical relationship to be identified in the business register is shown in diagram 7.1.

**Diagram 7.1: A typical hierarchical relationship to be identified in the business register**




7.21 As a minimum, the business register should include the following information:

(i) name and physical location of each enterprise;

(ii) mailing address, which may be different from its physical location;

(iii) name and address of the central office or the headquarter of the enterprise and establishments that are part of multi-establishment enterprise;

(iv) kind of economic activity, description or code;

(v) legal organisation - incorporated or unincorporated;

(vi) type of ownership: public (by central, state and local governments); national private and foreign controlled;

(vii) number of persons employed;

(viii) volume of sales or value of output;

(ix) source and date of information

7.22 Because of the typically large number of small establishments especially in the developing countries, the establishing and maintaining a complete directory would be very difficult and expensive. As a result, countries may establish a specific size cut-off and include in the business register only those establishments over a specific size which might differ by economic activity depending on the share in value added. A business register is a useful instrument in conducting the sample inquiries only if full coverage of the universe can be assured and it is accurately maintained. The difficulty of accurately maintaining statistical business registers is felt even in countries with well-developed statistical systems.

## B. Data collection strategy

7.23 As already mentioned, all units in the economy engaged in economic activities within the scope of the industrial sector should be covered for collection and reporting of industrial statistics. This embraces units of all sizes and types including the government and household units. The households unit include micro and small-scale manufacturing activities that are household-based and operate outside the household at a separate location or has no fixed location (i.e. mobile units). Unincorporated household unit is a term that is more appropriate in developing countries. In many developed countries, a household unit generally takes a more formal form of small enterprise and is incorporated. Some micro and small household units, however, may still remain unincorporated. The general data collection strategy for different segment of the economy is shown in diagram 7.2.

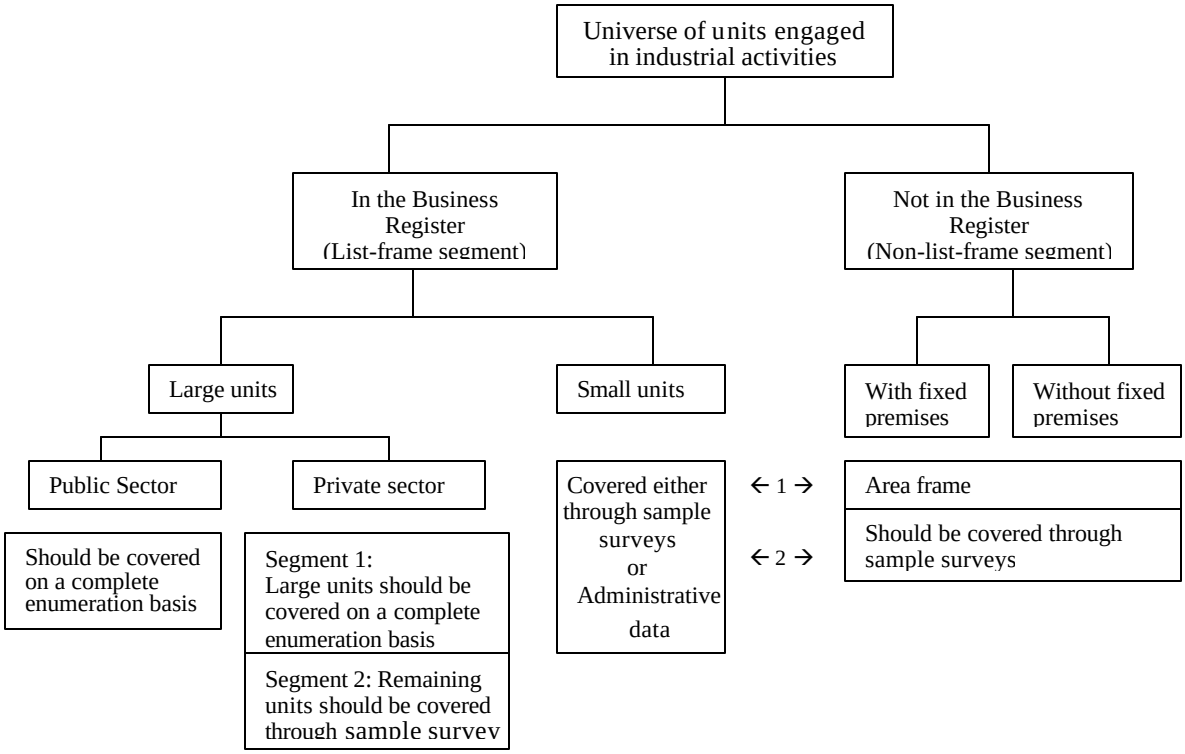
7.24 For complete coverage of the industrial activity, data collection strategy should be based on an integrated approach covering in principle all production units across all size classes including micro and small enterprises. The legal organisation (incorporated or unincorporated), size (from large to small and micro enterprises) and the ownership pattern (public sector, privately owned and foreign controlled) of units within the scope of the industrial statistics differ significantly. At one end of the spectrum are the corporate units which are incorporated under the statute of a country and are

comparatively large, while at the other end are the unincorporated enterprises characterised by low level of organisation. In view of this diversity, it is difficult, if not impossible, to devise a single strategy for data collection that is appropriate for all units in the scope.

7.25 The production units which are incorporated under the statute of a country are quite organised and are required to keep account of their transactions. These are the corporate units popularly known as companies and are required to present their annual accounts to the authorities with whom they are registered. A directory of such units is always available.

7.26 The number of incorporated public sector enterprises in this category is not expected to be large and such enterprises should be covered on a complete enumeration basis. The coverage of the private and foreign controlled incorporated enterprises should be achieved by dividing them into two segments – one containing the large-scale units and the second containing the rest. It might be considered that the large-scale segment of the economy is not suited for sample surveys because the differentiation in size and activity is great compared with number of units involved. Enterprises in large-scale segment, therefore, should be covered on a complete enumeration basis, if possible. The smaller enterprises, whose number tends to be much larger, are relatively homogenous as compared to the large-scale segment counterparts. Sample survey can gainfully be used to cover this segment of enterprises.

**Diagram 7.2: Data collection strategy for different segment of the economy**




1. All units on the business register are excluded from the area frame (i.e. non-list frame segment).

2. All units in the sample that are part of a list frame segment and included therein are excluded from the sample of non-list frame segment.

7.27 In developed countries the segment of small incorporated enterprises or unincorporated household enterprises are covered either through sample surveys as these are on the statistical business register or through the use of administrative data (tax returns of small enterprises). In developing countries, however, other method is necessary as the register of unincorporated enterprises is not available. This is discussed in the next section.

## C. Survey method

7.28 This section describes the Fully Integrated Rational Survey Technique (FIRST) (UN 1994b) for a survey programme that can be used for efficiently capturing comprehensive statistical information from enterprises of all sizes operating in an economy. Application of this survey methodology requires two basic statistical information, namely, (a) some census enumeration (preferably an economic census but a population census will generally be sufficient) to establish the complete statistical

universe for construction of sampling frame and sample selection, and (b) good supporting documentation on sample areas/enumeration blocks for the benchmark enumeration. Once these two basic requirements are met, the field conditions should determine the selection of the most appropriate design for any particular industrial survey.

7.29 The FIRST methodology requires the statistical universe to be divided into two parts, namely:

(a) a list-frame of a relatively small number of large units (hereinafter called the "list frame segment" that are clearly distinguished by their legal status from the rest of the units; and

(b) the rest of the units (hereinafter called the "non-list-frame segment") for which drawing an exhaustive list is not feasible and thus can be covered only by an (geographical) area frame approach.

7.30 For the "list-frame segment", either a complete enumeration or a uni-stage (most often stratified) sampling scheme is adopted for a FIRST survey. The sample of units (enterprises/establishments) is drawn directly from the list frame of the 'large units'. For the "non-list-frame segment" sub-sector, on the other hand, a FIRST survey usually employs a two-stage (in specific cases may be multi-stage) sample design. At the first stage, a sample of area units (henceforth referred to as 'first stage units' or simply fsu) is selected using the area frame. At the next stage, a list of all the units in the selected fsu (area unit) and falling in the domain of the survey is prepared and a second stage sample (of second stage units or ssu) is selected from this list for data collection.

7.31 The FIRST methodology is integrated both in terms of its scope across various economic activities as well as its coverage across size-classes within those activities. Any successful survey requires a clear and unambiguous definition of the statistical universe, without gaps and overlaps in its various segments. Integrated surveys such as those carried out under the FIRST are considered useful in this regard.

7.32 Covering all economic activities of the economy in an integrated manner has a distinct advantage over conducting a set of separate activity surveys (each carried out independently on a single group of economic activities) to cover the same domain. Besides reducing survey costs, an integrated survey ensures a non-overlapping coverage of groups of establishments by kind of economic activity. Each establishment is classified in one and only one sector. This, of course, requires a questionnaire designed to permit re-classification of an establishment afterwards when detailed enquiry reveals an inappropriate sector assignment at the selection stage.

7.33 In most surveys, such a unique assignment is not easy as a number of sub-sectors, such as tailors, shoemakers, etc., may be retailers, repairers or manufacturers according to the relative contribution of the various activities to total revenue. Evidences from different surveys in some countries suggest that such establishments may have been

enumerated as manufacturers in one and as retailers or repair-shops in another survey, thereby inflating the level of economic activity in the country as well as incorrectly representing the structure of industrial activity. It is the potential for omission and duplication of units that the separately-conducted activity surveys suffer from which constitutes the most important reason for extending the scope of the survey to include to the greatest possible extent all economic activities.

7.34 The FIRST methodology offers the additional advantage of providing comprehensive information collected in a short time-span with relatively modest means. The FIRST methodology, if properly implemented, obviates the need for trade-offs between survey contents and the timeliness of release of results that often plays an important role in survey designing. In sample surveys, a major cost component is generally transport to and from sampled enumeration areas. The listing stage of the sampled enumeration area involves the same amount of work whether activities from one or more ISIC sections are included within the survey. Thus, extension of the survey work to more activities generally entails only the extra costs for the time required to cover the larger number of establishments selected for the survey. This is a relatively minor cost component and if surveys are planned to cover various activities at same period of time, inclusion of additional units in the sampled area units would result in substantial savings in time, manpower and finances.

7.35 The same sample frame can, of course, be used to organise infra-annual, smaller and focused surveys. But the integrated surveys carried out using FIRST with the same frame, and using standard sampling procedures, permits direct comparison of survey results pertaining to different activity groups, something which is not possible when different procedures, reference periods and sampling frames are used for individual surveys.

*List-frame based survey of the 'list-frame segment'*

7.36 In the surveys conducted using FIRST, the list frame is usually drawn from a business register or a directory of units that consists of all the units of the "list frame segment" using the criterion of the legal and /or administrative status that distinguishes the 'large' units from the rest. This list is used for carrying out a FIRST survey preferably by mailed questionnaire with follow-up visits where required. The definition of large-scale used here is based on practical considerations and differs from country to country. The ease of maintaining the list frame forms the single most important criterion for the definition of the large-scale sub-sector. The list frame is usually made up of the following groups which are easily identifiable:

(a) publicly traded companies (i.e. companies listed on a stock exchange);

(b) non-traded companies (i.e. companies registered with a government agency such as the Justice Department, Ministry of Industry or the like);

(c) Government-owned enterprises (public enterprises which may also have been included under (a) or (b) above).

7.37 The first two groups are mutually exclusive but the third group, consisting of government-owned enterprises may overlap with either of the other two. Therefore, care should be taken to prevent double entries. These units have fixed address and are required by national law to maintain proper business accounts for their transactions. These could be reached with mailed questionnaires for required data.

7.38 Besides a single unduplicated frame, it is essential to use an integrated sample design to ensure complete and unduplicated coverage of the large-scale units. Availability of a list- frame permits a single-stage sampling for this sub-sector. But, estimation of the required parameters at a disaggregated level of 4-digit ISIC necessitates stratification by economic activities. Often, for a large country, separate estimates at the regional levels are also required. This requires further stratification of the list frame.

7.39 The population of establishments in the large-scale segment tends to be very heterogeneous in its size and characteristics. A relatively small number of establishments often account for a major share of the industrial production of the economy. Inclusion of all such units in the sample is expected to provide estimates of higher efficiency. Thus, for most establishment surveys, all units above a certain size (cut-off point) are included in the survey, while only a sample is drawn from the rest of the units. The stratum constituted of all such units is referred to as the 'certainty' or 'self-representing' stratum. The 'size' of an establishment for determining the cut-off point is often defined in terms of employment.

7.40 The units falling outside the self-representing stratum within the list-frame segment can gainfully be covered on a sample basis for both the annual and infra-annual enquiries. Adopting an integrated sample design for the both kinds of enquiries often help resolve the problems of inconsistency between the two sets of estimates obtained from them. Estimates of both annual and infra-annual change parameters as well as level parameters can be obtained using a suitably framed *rotating panel sample design* for the integrated survey. A rotating panel design has a number of advantages over *repeated cross sectional design* (independent samples on different occasions) as well as a *fixed panel sample design*, namely,

(a) It is cost effective and strikes a balance between the conflicting objectives of obtaining reliable estimates of annual and infra-annual estimates.

(b) Level of co-operation of the respondents tends to decline progressively with increasing number of revisits, thereby affecting the quality of response. Sample rotation eases the burden on respondents participating in the survey.

(c) The series of estimates obtained from repeated surveys employing a rotation panel-sampling scheme is usually free from large and unrealistic temporal variations. Moreover, use of rotation sampling permits use of composite

estimates that further restricts such temporal variations resulting from sampling error.

(d) This provides the scope of including the new units in survey coverage.

*Area-frame based survey of the 'non-list frame segment'*

7.41 All units *not* covered in the "list-frame segment" fall within the part of the universe described as the "non-list frame segment". Data collection for this sub-sector requires sampling of area units from an area frame formed from the data collected in the latest Economic or Population Census.

7.42 The FIRST methodology of integrated surveys for the "list-frame segment" and "non-list frame segment" captures complete data of all industrial activities for an economy as a whole in a consistent manner. This requires devising an operational rule to ensure that the units on the business register are excluded from the area frame for 'non-list frame segment'. Those establishments whose activities are consolidated in a parent company's accounts have to be deleted from the area sample. This refers, for example, to warehouses or depots operated by manufacturing companies in different parts of the country.

7.43 The FIRST is an establishment-type survey in principle, but, for the non-list frame segment uses area sampling techniques. In an area sampling technique of surveying households and establishments, a sample of area units are selected at the first stage. Next, in each of the selected first stage unit, it is required to identify and list all establishments operating in the selected area that are neither included nor linked to any enterprise appearing in the list frame used for the survey of the 'list frame segment'. The establishments thus identified and falling in the coverage of the survey are then classified by kind-of-activity and a sample of units is drawn from the listed establishments for each kind-of-activity.

7.44 The group of activities that are given special treatment in this approach is that of the mobile units such as those in trade, services and transport, which form an important group in most developing countries. This approach permits covering of the enterprises/ establishments that are run by the households, even those without fixed premises.

7.45 In this approach, all identifiable establishments outside the owners' home located in the selected area unit as well as household-based enterprises located within home are listed by a house-to-house (structure-to-structure) visit. In addition, the units without any fixed premises of operation like hawkers, street vendors and service providing free-lancers (mobile units) are identified through additional questions put to the households at the listing stage and are listed against the household where the proprietor (or a partner of a partnership concern) resides. This way it is ensured that all establishments in the selected areas that are within the scope of the survey are included in the list which is then used for selection of sample of establishments.

7.46 It should be noted that a partnership enterprise without a fixed premise may get reported by each of its partners belonging to different households. The duplication of coverage on this account has either to be adjusted for in the survey estimation procedure or the possibly be eliminated by adopting special listing rules. One such rule, adopted for surveys on establishments of the unorganized sector in India, is to list a partnership enterprise only against the household of the partner who takes major decisions for running the enterprise.

7.47 The sampling frame should desirably contain information on the distribution of the units by economic activity in the economy. The sampling frame built from the population census data on persons engaged in different economic activities often fail to reflect the locations of activity-specific units. For many small-scale industrial activities, the distribution is closely linked to population concentrations but the activity of mining and quarrying is an exception as the activity is carried out in areas where the minerals are found and not necessarily where the population pursuing such activities resides. This problem could be addressed to a large extent by basing the sample selection at the first and/or second stage according to the density of such production units.

## D. Scope and coverage of various inquiries

### 1. *Annual inquiry*

7.48 All countries, regardless of the development of their statistical system, have a limit to the resources available for data collection. Nonetheless, countries should endeavour to provide estimates that cover all industrial establishments, using complete enumeration of all establishments above a certain size and sampling for the others, including those in the non-list frame segment. For the list-frame segment, the survey can be conducted through mail or other modes of communications. All the survey units in the list-frame might receive an inquiry form, but an abbreviated version might be used for the small establishments. Covering the non-list frame segment would require multi-stage sampling, with area units selected at the first stage and the survey to be done through interviews in most cases. Conducting annual area frame based surveys generally requires too much resource to be afforded by the countries, particularly those with significant contribution from the non-list frame segment. In such countries, periodic (once in five or three years) are required to be conducted for the non-list frame segment to provide the data required for benchmarking. Annual and infra-annual estimates for the non-list frame segment might be made from other statistical inquiries labour force surveys, for example).

## 2. *Infra-annual inquiry*

7.49 The coverage of the infra-annual inquiry[1], normally quarterly or monthly, is necessarily more restricted than that of the annual inquiry. Even in countries with a highly developed statistical system, it would be difficult to cover small establishments monthly or quarterly to generate short-term production related statistics to establish the business cycle on supply, demand and production factors. However, if small establishments are significant in a particularly important industry, they should be included in the coverage.

7.50 A pressing practical problem in these inquiries is to restrict in some way the number of statistical units to be enumerated. The techniques by which this restriction is effected will necessarily differ depending on the characteristics of the particular branch of industry being dealt with. For example, where a major share of output is produced by a few establishments, as in the steel or cement industries, all establishments can be covered and enumerated. At the other extreme, in baking or brick production, for example, a larger number of small establishments may produce a major part of the total output of the branch and sampling techniques should be used. In countries with significant contribution from small establishments, a large part of such activities are carried out in establishments not in the list-frame. Ideally, the non-list frame segment should also be covered in the infra-annual surveys in such countries, subject to availability of resources. However, where the resources do not permit coverage of non-list frame segment, the infra-annual surveys should have all establishments in the list-frame in scope, by enumerating all establishments above a given size cut-off completely while using sampling to cover establishments below the cut-off.

## 3. *Infrequent inquiry*

7.51 Infrequent inquiries seek topical information on items which are not asked for in the annual inquiries. These enquiries are used for collection of data on specialised topics which is not dealt with in this recommendation.

## 4. *Baseline inquiry for the non-list frame segment*

7.52 For the countries with significant contribution from the non-list frame segment, it is essential to collect data on the establishments of this segment. As this requires conducting surveys based on area-frame sampling, which are resource intensive and time consuming, a baseline inquiry of this segment is carried out for comprehensive economic data collection. They are normally carried out every 5 years only, while similar or fewer data are collected through annual or more frequent inquiries. The benchmark estimates derived from the baseline inquiry may be projected forward using the estimates of change and growth obtained from annual and infra-annual inquiries, either on the non-list frame segment or any other inquiry of relevance.

[1] The term "infra-annual enquiry" replaces the term "more-frequent-than-annual enquiry" used in UN 1983.

## E. Reconciling the results of infrequent or annual benchmark surveys with infra-annual surveys

7.53 Infra-annual macro-economic statistics are an important source of information when developing and making economic policy and carrying out business cycle analysis. These statistics should give signals that are coherent with the information provided by low-frequency statistics, those generally obtained from the results of annual or even less frequent surveys. Therefore, the national statistical offices are frequently faced with the situation of having low frequency data (annual or less frequent) that are comprehensive but not very timely, and high frequency data (quarterly and monthly) that are timely but have lower accuracy, less detail and reduced scope

7.54 There is a need therefore, to identify and use appropriate statistical techniques to combine these two sets of data to produce timely, high frequency estimates of the highest degree of accuracy, reliability and detail possible. Benchmarking techniques play a central role in meeting this challenge by improving key dimensions of data quality. The main aim of these techniques is the *reconciliation* of the statistical information coming from different data sources, in order to obtain short-term data series that, while obeying the constraints imposed by the more reliable and accurate long-term information sources (benchmarks), preserve as much as possible the dynamic time-profile of the high frequency time series

7.55 In a broad sense, *benchmarking techniques* are those processes which optimally combine two or more sources of measurements in order to obtain reliable estimates of the series under investigation. Following the nature of the problem at hand, benchmarking techniques are generally distinguished into *interpolation* or *distribution* techniques. While interpolation refers to the estimation of missing observations of stock variables, a distribution (often called *temporal disaggregation*) problem occurs for flow and time averages of stock variables. In the distribution case, for example, the problem concerns the estimation of intra-period data for a given time series subject to the constraint that their sums (or averages) equal the aggregates over the lower frequency.

7.56 Both interpolation and distribution problems are optimally solved in the literature under a simple time-series regression framework, by assuming that the observed linear relationship between the low-frequency (benchmark) and the high-frequency (also called related) series, temporally aggregated at the level of the low-frequency series, is equal to the relationship between the unknown benchmark series and the related series. In other words, a linear regression is estimated between the known low-frequency series and the time-aggregated related series, and the same estimated coefficients are applied to the known values of the related high-frequency series in order to obtain estimates of the short-term data that obey the benchmark constraints. This method yields optimal solution in a statistical sense, as they allow the user to obtain a solution that simultaneously takes into consideration the time-dynamics of the related

and high-frequency series and the constraints imposed by the more reliable benchmark series.

7.57 Some of the commonly used methods for benchmarking are Pro-rata distribution, Proportional Denton Method (Denton 1971), Autoregressive integrated moving average (ARIMA) model-based method and regression based methods. Detailed explanations on these methods, as well as an analysis of the available software for reconciliation can be found in Eurostat (1999) and IMF (2001).

## F. Reference period

7.58 In both the annual and the infrequent inquiries, the data compiled should, in general, relate to a 12-month period. Because of this, there should be few, if any, problems, as far as the reference period is concerned, in integrating data from these inquiries. This 12-month period should preferably be the (Gregorian) calendar year. However, where data are more readily available for particular establishments on a different fiscal-year basis, it may be necessary to accept data on that basis. In such instances, it would be desirable to collect some items of data, such as wages and salaries, on both a fiscal-year and calendar-year basis to facilitate building up calendar year aggregates. If a fiscal year different from the calendar year is the normal accounting period for most establishments, the data may be compiled uniformly on a fiscal year rather than a calendar year basis. There are advantages if all establishments can submit returns covering an identical 12-month period, particularly in integrating the annual data with monthly or quarterly data. In many countries, the closing dates of the financial years of companies are spread widely over the year, and statistical offices find it difficult to obtain returns from establishments for a consistent 12-month period. If reporting periods differ in this way, a supplementary table in the published report showing the distribution of end-year dates by months will help users of the figures to estimate the period over which they are centred.

7.59 For the infra-annual inquiries, the reference period should normally be the calendar month or the calendar quarter (three months: January-March, April-June and so on). However, some establishments work in quarterly periods of four, four and five weeks, and in such cases it will be necessary for the statistical office to standardize the information provided in the monthly returns by some estimation procedure.

7.60 It should be noted that a number of difficulties may arise if monthly or quarterly data are to be aggregated to provide annual figures, thereby avoiding the need to collect the same data annually. Even if the scope, coverage, statistical unit and data definitions are the same in the infra-annual inquiries as in the annual, the reference period may still cause problems. If the units in the annual inquiry report are for a varying 12-month period (that is, some for the calendar year and others for a fiscal year), then to integrate the short-period data and the annual data may require a unit-by-unit aggregation of the monthly or quarterly data. As mentioned in paragraph 7.58 one solution is to collect annual returns for all establishments for an identical 12-month period. However,

differences in scope, coverage and statistical unit may make it difficult to integrate the results of the two types of inquiry in this way, and problems arising from these sources will be compounded by the normally provisional nature of the data reported in the infra-annual inquiries.

# VIII DATA QUALITY AND METADATA

## A. Enhancing the Quality of Industrial Statistics

8.1 Industrial statistics are the end product of a complex process comprising many stages from the collection and processing of data to compilation and dissemination of statistics. Quality measurement of industrial statistics is concerned with providing the user with sufficient information to judge whether or not the data are of adequate quality for their intended use, i.e. to judge their "fitness for use". For example, data users must be able to verify that the conceptual framework and definitions that would satisfy their particular data needs are the same as, or sufficiently close to those employed in collecting and processing the data. Users should also to be able to assess the degree to which the accuracy of the data is consistent with their intended use or interpretation. All the measures that a statistical office takes to assure quality of statistical information constitute a quality management.

8.2 Several statistical organisations and countries[1] have developed definitions of quality, outlining the various dimensions (aspects) of quality and quality measurement and integrated them into quality assessment frameworks. Although the existing quality assessment frameworks slightly differ in their approaches to quality and number/name of quality dimensions (see Box 8.1) they compliment each other and provide comprehensive and flexible structures for the qualitative assessment of a broad range of statistics.

(i) The *IMF Data Quality Assessment Framework (DQAF)* takes a holistic view of data quality and includes governance of statistical systems, core statistical processes and statistical products. The Framework is organised in a cascading structure covering the prerequisites and five dimensions of quality – assurance of integrity, methodological soundness, accuracy and reliability, serviceability and accessibility.

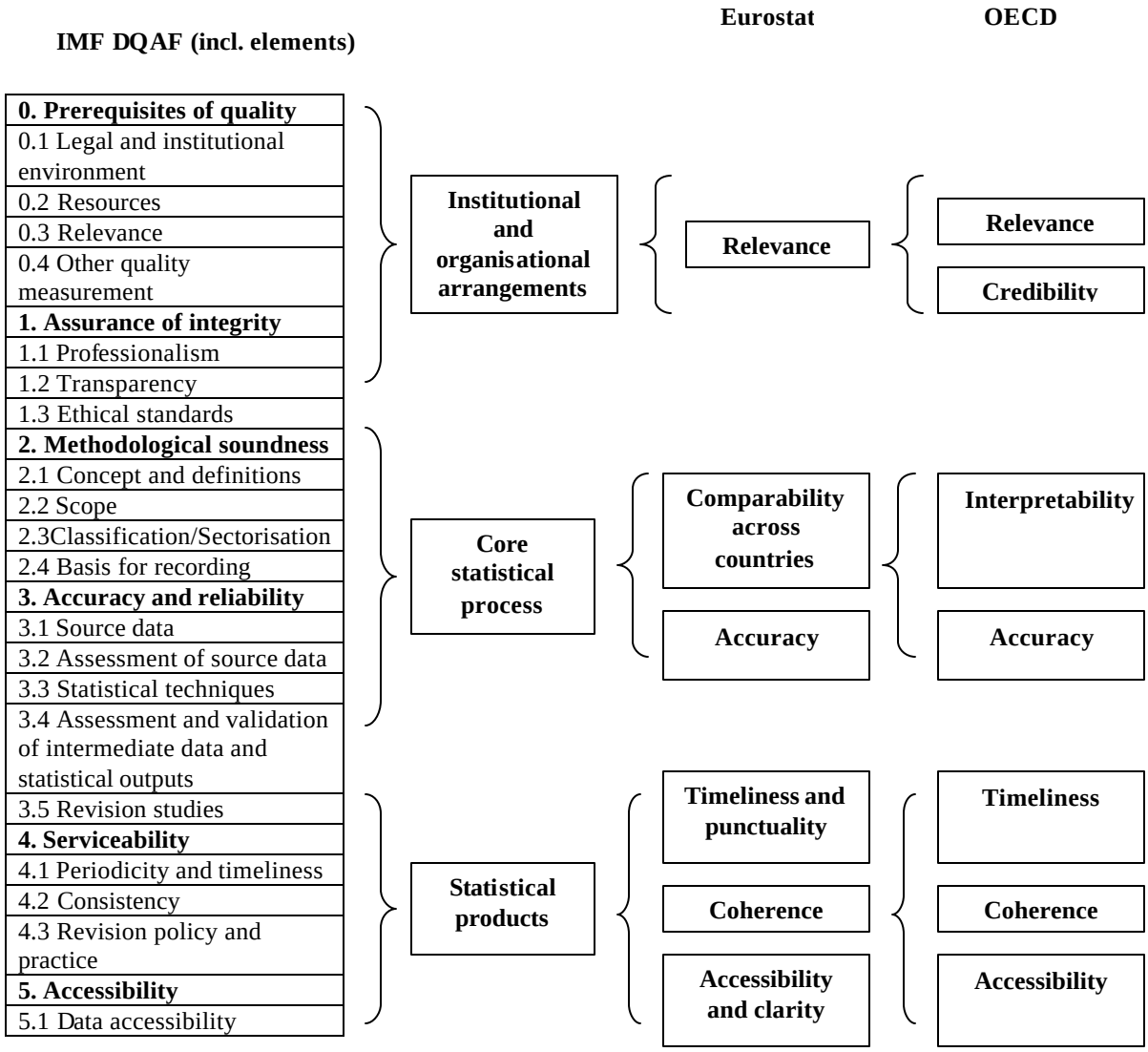
(ii) The *European Statistical System (ESS)* focuses more on statistical outputs and defines the quality of statistics with reference to six criteria – relevance, accuracy, timeliness and punctuality, accessibility and clarity, comparability and coherence.

(iii) The *OECD Quality Measurement Framework* views quality as a multi-faceted concept. Like Eurostat approach, the quality characteristics depend on user

[1] (a) IMF Data Quality Assessment Framework - http://dsbb.imf.org/Applications/web/dqrs/dqrsdqaf/; Eurostat;
(b) Assessment of quality in statistics - Definition of Quality in Statistics", Working Group, Luxembourg, October 2003;
(c) Quality Framework for OECD Statistics, OECD, Paris, June 2002;
(d) Guidelines for Measuring Statistical Quality, UK Office for National Statistics;
(e) Quality Assurance Framework, Statistics Canada and
(f) Quality Guidance for Official Statistics, Statistics Finland; etc.

perspectives, needs and priorities, which vary across groups of users. The quality is viewed in terms of seven dimensions – relevance, accuracy, credibility, timeliness, accessibility, interpretability and coherence.

**Box 8.1. Comparison between IMF Data Quality Assessment Framework, Eurostat Quality Definition and OECD Quality Measurement Framework**




Source: Lucie Laliberte, Werner Grunewald and Laurent Probst (2003): Data Quality: A Comparison of IMF's Data Quality Assessment Framework (DQAF) and Eurostat's Quality Definition. Available from http://www.oecd.org/dataoecd/26/3/17831984.pdf
The last column showing the comparison with the OECD Quality Measurement Framework is by the UNSD.

8.3 The overall aim of quality assessment frameworks is to standardise and systematise statistical quality measurement and reporting across countries. They allow an assessment of national practices to be made against internationally accepted statistical approaches for quality measurement. Quality assessment frameworks could be used in a number of aspects, including for (i) guiding countries' efforts for strengthening their statistical systems by providing a self-assessment tool and for identifying areas of improvement; (ii) technical assistance purposes; (iii) reviews of particular statistical domains performed by international organisation; and (iv) assessment by other groups of data users.

***Dimensions of quality***

8.4 National statistical offices may either use the existing frameworks for quality assessment of industrial statistics directly or can develop their own national quality assessment frameworks that fit best their countries practice and circumstances. The following dimensions of quality should be taken into account in developing the quality assessment framework and measuring and reporting the quality of industrial statistics – prerequisites of quality, relevance, credibility, accuracy, timeliness, methodological soundness, coherence, and accessibility. They form a broad view of quality and as such participate in most of the existing frameworks.

(i) *Prerequisites of quality.* Prerequisites of quality refer to all institutional and organisational conditions that have an impact on the quality of industrial statistics. The elements within this dimension include the legal basis for compilation of data; adequacy of data sharing and coordination among data producing agencies; assurance of confidentiality of data provided by units; adequacy of human, financial, and technical resources for implementation of industrial statistics programmes and implementation of measures to ensure their efficient use; and quality awareness.

(ii) *Relevance.* The relevance of industrial statistics reflects the degree to which it meets the needs of users. Therefore, measuring relevance requires identification of user groups and their needs. The statistical offices should balance the different needs of current and potential users to produce a program that goes as far as possible in satisfying the most important needs of users for both coverage and content of industrial statistics given the resource constraints. The indicators of relevance are the requests of users, conducted users' satisfaction surveys and their results, the identified gaps between key user interests and compiled industrial statistics in terms of concepts, coverage and details.

(iii) *Credibility.* The credibility (referred to as assurance and integrity in IMF DQAF) of industrial statistics refers to the confidence that users place in those data and the statistical office or agency that produces the data. Users' confidence is built over time. One important aspect is trust in the objectivity

of the data. This implies that the data are perceived to be produced professionally in accordance with appropriate statistical standards, and that policies and practices are transparent. For example, data should not be manipulated, nor their release should be timed in response to political pressure.

(iv) *Accuracy*. The accuracy of industrial statistics is the degree to which the data correctly estimate or describe the quantities or characteristics they are designed to measure. It has many attributes and in practice there is not a single aggregate or overall measure of accuracy. In general, it is characterized in terms of errors in statistical estimates and is traditionally decomposed into bias (systematic error) and variance (random error) components, but also it includes description of any processes undertaken by statistical offices to reduce measurement errors. In the case of sample surveys-based estimates, the accuracy can be measured using the indicators: coverage, sampling errors, non-response errors, response errors, processing errors, measuring and model errors. Revisions and revision studies of industrial statistics undertaken at regular intervals are considered a gauge of reliability.

(v) *Timeliness*. The timeliness of industrial statistics refers to the amount of time between the end of the reference period to which the data pertain, and the date on which the data are released. The concept of timeliness applies equally to short-term and structural data as the only difference is the timeframe. Timeliness is closely related to the existence of a publication schedule. A publication schedule may comprise a set of target release dates or may involve a commitment to release industrial data within prescribed time period from their receipt. This dimension is usually a trade-off against accuracy. The timeliness of information also influences its relevance. Punctuality is another measure of timeliness. It shows the amount of time between the identified release date and the effective dissemination date of industrial statistics.

(vi) *Methodological soundness*. The methodological soundness is a dimension that refers to the application of international standards, guidelines and good practices in production of industrial statistics. The adequacy of the definitions and concepts, target populations, variables and terminology underlying the data, and information describing the limitations of the data, if any, largely determines the degree of adherence of particular dataset to international standards. The metadata provided along with industrial statistics play a crucial role for assessing the methodological soundness of data. They inform the users on how close to the target variable (for example any of the data items) the input variables used for their estimation are. When there is a significant difference, it should be explained to what extent this may cause a bias in the estimation. The methodological soundness is closely related to the interpretability of data. The interpretability depends on all aspects of information on industrial data mentioned above. It reflects the ease with which the user may understand and properly use and analyze the data.

(vii) *Coherence.* The coherence of industrial statistics reflects the degree to which the data are logically connected and mutually consistent, i.e. they can be successfully brought together with other statistical information within a broad analytical framework and over time. The use of standard concepts, classifications and target populations promotes coherence, as does the use of common methodology across surveys. Coherence does not necessarily imply full numerical consistency. Coherence has four important sub-dimensions:

(a) *Coherence within a dataset* implies that the elementary data items are based on compatible concepts, definitions, and classifications and can be meaningfully combined. For industrial statistics this sub-dimension means that all data items are compiled on the methodological basis of the recommendations presented in this document.

(b) *Coherence across datasets* implies that the data are based on common concepts, definitions and classifications. The coherence between industrial statistics and national accounts will be ensured if all data sets are based on common concepts, definitions, valuation principles, classifications etc., or that any differences are explained and can be allowed for;

(c) *Coherence over time* implies that the data are based on common concepts, definitions, and methodology over time. This property will be achieved if, for example, the entire time series of industrial statistics is compiled on the basis of the international recommendations for industrial statistics. It is recommended that deviations, if any, from the international recommendations be clearly indicated;

(d) *Coherence across countries* implies that the data are based on common concepts, definitions, and methodology over time. Coherence of industrial statistics across countries may depend on the extent of implementation of the international recommendations.

(viii) *Accessibility.* The accessibility of industrial statistics refers to the ease with which they can be obtained from the statistical office. This includes the ease with which the existence of information can be ascertained, as well as the suitability of the form or the media of dissemination through which the information can be accessed. The aspects of accessibility are also the availability of metadata and the existence of user support services. Accessibility requires development of an advance released calendar so that users are informed well in advance on when the data will be available, where and how to access them.

8.5 These dimensions of quality are overlapping and interrelated and as such form a complex relationship. An action taken to address or modify one aspect of quality will tend to affect other elements of quality. For example, there may be a trade-off between aiming for the most accurate estimation of the total annual sales, and providing it in a timely manner when this information is still of interest to the users. If countries are not in a position to meet simultaneously the accuracy and timeliness requirements in compiling a particular industrial statistics dataset, a provisional estimate which is available soon after the end of the reference period but which is based on less comprehensive data content should be produced. This estimate is supplemented at a later date with information that is based on more comprehensive data content but which is less timely than its provisional version. If there is no conflict between these two quality dimensions, there is no need of producing both estimates.

8.6 Measuring the quality of industrial statistics is not a simple task. The problems arise both in quantifying the level of individual dimensions and in aggregating the levels of all dimensions and therefore, it is not possible to derive a single quantitative measure of quality for industrial statistics. In the absence of such a single measure countries are encouraged to use a system of quality indicators (see the section B below). Countries may also develop their own industrial statistics quality framework based on the above mentioned approaches and dimensions and the specific circumstances of their economies and regularly issue quality reports as part of their metadata. The quality framework allows for a practical approach to providing data that meet different users' needs, while the provision of quality information will allow users to judge for themselves whether a dataset meets their particular quality requirements. The quality review of industrial statistics may be undertaken every four to five years or more frequently if significant methodological changes or changes in the data sources occur.

## B. Quality indicators versus direct quality measures

8.7 Quality measures are defined as those items that directly measure a particular aspect of quality. For example, the time lag from the reference date to the release of data is a direct quality measure. However, in practice it may be difficult to devise measures for each dimension/aspect of data quality. Instead quality indicators can be used as substitute for quality measurement.

8.8 Quality indicators are summarized quantitative data that provide evidence about the quality or standard of the data produced by national and international statistical agencies. They are linked to the achievement of particular goals or objectives.

8.9 Quality indicators usually consist of information that is a by-product of the statistical process. They do not measure quality directly but can provide enough information for the assessment of a quality. For example, in the case of accuracy it is almost impossible to measure non-response error as the characteristics of non-responders can be difficult and costly, to ascertain. In this instance, response rate is often used as a quality indicator which provides a measure of the possible extent of non-response bias.

8.10 It is not the intention that all quality dimensions should be addressed for all data sets. Instead, countries are encouraged to select those quality measures/indicators that together provide an indication of the overall strengths, limitations and appropriate uses of a given dataset. Some types of quality measures and indicators may be produced for each data item, for example item response rate of total turnover (data item 5.1) may be calculated with each new estimate. On the other hand, some others may be produced for all data items and would be re-written only if there are changes. An example of the latter type is the description of survey approaches to data collection (for example, the quality dimension "methodological soundness" para 8.4 vi) which would be applicable to all industrial statistics data items.

8.11 The quality indicators used for industrial statistics should be easy to interpret and methodology for their compilation is well established. It may cover part or all of the dimensions of quality as defined previously. Quality indicators can be classified as:

(a) *Key indicators* – those that provide the direct measure of the data quality, for example, the coefficient of variation, measuring the accuracy of industrial statistics obtained through sample surveys and the time lag between the end of the reference period and the date of first release of data, measuring the timeliness of industrial statistics;

(b) *Supportive indicators* – those that provide an indirect measure of the data quality, for example, the average size of revisions between provisional and final estimates of particular dataset which measures the accuracy of industrial statistics;

(c) *Indicators for further analysis* which are subject to further examination and discussion of statistical offices. Countries may decide to conduct a user satisfaction survey and calculate a user satisfaction index for measuring the relevance of industrial statistics.

8.12 It is important to maintain a correct balance between different dimensions of quality and use of a minimum number of indicators. The objective of quality measurement is to have a limited set of indicators that can be used to measure and follow over time the quality of the industrial statistics produced by the statistical office and that the users are provided with a useful summary of overall quality, while not overburdening respondents with demands for additional quality metadata.

8.13 The table 8.1 provides a limited set of key indicators[2] which countries are encouraged to use on a regular basis for measuring quality of industrial statistics. They

[2] For more quality indicators see
(a) European Statistics Code of Practice, available from http://epp.eurostat.ec.europa.eu/portal/page?_pageid=2273,1,2273_47140765&_dad=portal&_schema=PORTAL
(b) IMF DQAF site at http://dsbb.imf.org/Applications/web/dqrs/dqrsdqaf/; and
(c) UK Office for National Statistics Guidelines for Measuring Statistical Quality, available from http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=13578

are easy to implement and give users a clear and up-to-date overview of the overall quality of industrial statistics.

**Table 8.1 Minimum set of key quality indicators**

| Quality dimension | Quality measures/indicators |
|---|---|
| Relevance | $R_1$. Identification of gaps between key user interests and compiled industrial statistics in terms of concepts, coverage and detail.<br><br>$R_2$. Users' satisfaction surveys |
| Accuracy | $A_1$. Sampling errors of estimates<br>- Coefficient of variation<br>$A_2$. Non-sampling errors<br>- Unit response rate<br>- Item response rate<br><br>$A_3$. Number and average size of revisions of industrial statistics |
| Timeliness | $T_1$. Time lag between the end of the reference period and the date of the first release (or the release of final results) of industrial statistics |
| Methodological soundness | $MS_1$. Number and rates of differences in concepts and measurement procedures used in the collection/compilation of industrial statistics from the relevant international statistical standards |
| Coherence | $CO_1$. Comparison and joint use of related industrial statistics derived from different sources |
| Accessibility | $AC_1$. Number and types of means used for dissemination of industrial statistics<br><br>$AC_2$. Industrial statistics datasets made available by mode of dissemination as a percentage of total industrial datasets produced |

## C. Metadata on industrial statistics

8.14 *Content of statistical data.* Generally, statistical data consists of the following:

(a) *Microdata* - data on the characteristics of units of a population, such as establishments, collected through a census or a survey;

(b) *Macrodata* - data derived from microdata by grouping or aggregating them, such as total number of establishments or total value added;

(c) *Metadata* - data which describe the microdata, macrodata or other metadata.

8.15 *Metadata.* The term metadata defines all information used to describe other data. A very short definition of metadata then is "data about data". Metadata descriptions go beyond the pure form and contents of data. They are used to describe administrative facts about data (who created them, and when), how data were collected and processed before they were disseminated or stored in a database. In addition, metadata facilitate efficient searching and locating of data.

8.16 *Statistical metadata.* Statistical metadata describe or document statistical data, i.e. microdata, macrodata or other metadata. They facilitate sharing, querying, and understanding of statistical data over the lifetime of the data. They also refer to any methodological descriptions on how data are collected and manipulated. For industrial statistics data items for example, metadata include the name of the data item, the unit from which the information is collected, data sources, information about classifications used and series breaks, definitions and methodologies used in their compilation. Metadata are essential for the interpretation of statistical data. Without appropriate metadata, it would not be possible to fully understand and interpret the statistical data.

8.17 There is a bidirectional relationship between metadata and quality. On the one hand, metadata describe the quality of statistics. On the other hand, metadata are themselves a quality component, which improves the availability and accessibility of statistical data.

8.18 The wide range of possible users and uses of industrial statistics requires that a broad spectrum of metadata requirements has to be addressed. In particular the statistical offices as data suppliers must make sufficient metadata available to enable the least and the most sophisticated users to readily assess the data quality. Countries may develop layered approach to metadata presentation for groups of users in which each successive layer provides more detail. As a minimum segmentation, the following two levels of metadata are recommended:

(i) *Structural metadata* presented as an integral part of the data tables;

(ii) *Reference metadata* providing details on the content and quality of data that may accompany the tables or be presented separately via the internet or in occasional publications.

8.19 Metadata provides a mechanism for comparing national practices in the compilation of statistics. This may help and encourage countries to implement international standards and to adopt best practices in the compilation of particular

statistics. Better harmonisation of approaches adopted by different countries will improve general quality and coverage of key statistical indicators.

8.20 The most fundamental purpose of metadata is to help users of industrial statistics to understand, analyze and interpret the data, even if they have not themselves participated in the process of production of these data. In other words, industrial statistics metadata should help users to transform statistical data into information. The metadata is also helpful to producers of statistics. The new knowledge gained from interpreting the data may also lead to both production (lower the costs and improving the data quality) and dissemination (dissemination of comprehensive, timely, accessible, and reliable data) enhancements.

8.21 The metadata of the disseminated industrial statistics should include the following six main components – (i) data coverage, periodicity, and timeliness; (ii) access by the public; (iii) integrity of disseminated data; (iv) data quality; (v) summary methodology; and (vi) dissemination formats. Each of these components is characterized with a few monitorable elements that can be observed, or monitored by the users.

8.22 Countries are encouraged to accord development of metadata a high priority and to consider their dissemination an integral part of dissemination of industrial statistics. Moreover, it is recommended that in consideration of the integrated approach to compilation of economic statistics development of a coherent system and a structured approach to metadata across all areas of economic statistics be adopted, focusing on improving their quantity and coverage.

8.23 The Statistical Data and Metadata Exchange (SDMX[2]) technical standards and content-oriented guidelines provide common formats and nomenclatures for exchange and sharing of statistical data and metadata using modern technology. The dissemination of national data and metadata using web technology and SDMX standards is recommended as a way to reduce the international reporting burden. Various international organizations such as the IMF, Eurostat and the OECD have developed metadata standards and collected metadata for different areas of statistics.

[2] For more details see http://www.sdmx.org/

# IX. DISSEMINATION OF INDUSTRIAL STATISTICS

## A. Dissemination

9.1 Data dissemination consists of distribution or transmission of statistical data to policy makers, business community and other users. It is one of the important activities of the national statistical office. Statistical authorities collect data using the legal authority derived from the national statistical acts and regulations. These regulations require that the data provided by the respondents should be kept confidential. The dissemination strategy of the national statistical office should obviously meet the requirements of the legal/administrative regulations.

9.2 The dissemination of statistical information by the statistical offices should be delineated by three benchmarks; confidentiality, equality and objectivity (Eurostat 1998). These benchmarks are discussed in the following paragraphs.

### 1. *Statistical Confidentiality*

9.3 The data furnished by statistical units relating to their businesses is considered to be confidential and should not be used for any other than the statistical purposes. The disseminated data are considered confidential when they allow reporting units to be identified either directly or indirectly and thereby disclosing individual information. Breaching the borderline of confidentiality bears the risk of a disturbed relationship between the national statistical office, respondents and users. Respondents would become suspicious with respect to protection of their privacy and may not cooperate with the national statistical office for supply of information in future. The users on the other hand would become suspicious regarding the independence of the national statistical office and casting doubts on the objectiveness and reliability of data. The United Nations Fundamental Principle of Official Statistics (see Box 9.1) provides the basis for managing the statistical confidentiality.

**Box 9.1: United Nations Fundamental Principle of Official Statistics on statistical confidentiality**

"Individual data collected by statistical agencies for statistical compilation, whether or not they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes." (UNSC 1994)

9.4 The results of industrial survey are usually published in the form of tables which do not contain information from individual respondents but aggregated information referring to a number of respondents. Some times it is possible to deduce the information about an individual respondent from the total especially when contribution of one respondent dominates this total.

9.5 To protect the disclosure of information of an individual enterprise statistical disclosure control of tabular data should be put into place. Statistical disclosure control techniques are defined as the set of methods to reduce the risk of disclosing information on individual reporting units. While such methods manifest themselves at the dissemination stage, they are pertinent to all stages of the statistical process.

9.6 As the first step in the statistical disclosure control of tabular data, the sensitive cells need to be identified. The sensitive cells are those that tend to reveal too much information about an individual reporting unit and these are identified using a dominance rule. This rule states that if the sum of the contributions of a specified number of units account for more than a specified proportion of the total cell value then this cell value can not be published.

9.7 The logic of the dominance rule is that if the value of one respondent dominates a cell value then it is possible to deduce its contribution fairly accurately. In particular, if there is only one respondent then his contribution will be disclosed exactly. If a cell total comprises values from only two respondents, each one of them can disclose the contribution of the other exactly by subtracting its own contribution from the total cell value. If the value of a cell is dominated by the contribution of two respondents, each of these respondents is able to estimate the value of the contribution of the other.

9.8 The national statistical office should never publish data that may lead to disclosure of information regarding individuals, institutions or businesses. In business statistics, a commonly accepted rule is that a tabulation cell should comprise at least 3 units. For cells with largest numbers, the three units with the largest values should together do not dominate, i.e. account for less than 70 per cent of the cell value.

9.9 The most common practices to protect the disclosure of confidential data include:

(i) *Aggregation*. A confidential cell in a table is aggregated with another cell and then the information is disseminated for the aggregate and not for the two individual cells. This, for example, often results in grouping of industrial data which are confidential at the class (4-digit) level of ISIC with another class and present and disseminate them at the group (3-digit) level of ISIC.

(ii) *Suppression*. Suppression means removing records from a database or a table that contains confidential data. This is a method that allows statisticians not to publish the values in sensitive cells while publishing the original values of the others (primary suppression). Suppressing only one cell in a table however, means that the calculation of totals for the higher levels to which that cell

belongs cannot be calculated. In this case, other cells must also be suppressed to guarantee the protection of the values under the primary cells, leading to the secondary suppression.

(iii) *Other methods*. Controlled rounding and perturbation are more sophisticated techniques for protecting confidentiality of data. Controlled rounding allows statisticians to modify the original value of each cell by rounding it up or down to a near multiple of a base number. Perturbation represents a linear programming variant of the controlled rounding technique.

9.10 Data collected and disseminated by international organisations depend to a large degree on the quality and completeness of the data supplied by the countries. Therefore, the issue of confidentiality has not only a national dimension, it is also becoming an international issue for the following reasons (i) increase of data dissemination over the internet; (ii) internationalisation of users of statistical data (including international organisation); and (iii) high interest in cross-country comparisons. As a result, there is a growing demand for countries data at very detailed level, even in some cases – demand of countries micro-data.

## 2. *Equality*

9.11 Statistics compiled by national statistical offices are collective goods which imply that no users are privileged and every citizen can take note of statistical data under equal terms. It is important to ensure that no new data are supplied to anyone before these are officially released. In most cases press release is the first publication. The press release serves dual purpose in that apart from making the data officially public it also sends a signal to the data users that additional data on the subject can be obtained from the national statistical office.

9.12 To ensure the dissemination of industrial statistics to all users at the same time, the national statistical offices should develop and announce an advance release calendar. The advance release calendar should be given sufficient publicity and should also be posted at the national statistical office website in beginning of each year.

9.13 Timeliness of release of annual and infra-annual industrial statistics varies greatly from country to country, mainly reflecting different perspectives on the timeliness-reliability-accuracy trade-off. In keeping with sound statistical practices, countries are encouraged to release their initial monthly data forty five days after the end of the reference month, quarterly data - three months after the end of the quarter, and their annual data – eighteen months after the end of the year. Monthly and quarterly data should refer to a discrete month or quarter. Most countries use a separate system for compilation of annual industrial statistics. In this case the data for the fourth quarter need

to be published in their own right, and not derived as a difference between the annual totals and the sum of the first three quarters.

### 3. *Objectivity*

9.14 Released data should not be accompanied by judgments or recommendations. The independent and objective position of the national statistical office does not permit subjective interpretations.

## B. Data revisions

9.15 The revision of data released earlier is an essential part of countries practices on compilation of industrial statistics. The revision in the estimates is an inescapable statistical activity in all countries both developed and developing. It is inherent basically in the way estimates are compiled and released by the national statistical offices – from 'preliminary' (based mainly on trends in indicators and statistical techniques), to 'provisional' (based on limited amount of data) to 'final' (based on comprehensive data or as a result of benchmarking). Revisions occur as a consequence of the trade-off between the timeliness of published data and their reliability, accuracy and comprehensiveness. To meet the user need timely national statistical offices compile preliminary estimates that are revised later when new and more accurate information become available. Although, in general, repeated revisions may be perceived as reflecting negatively on the reliability of official industrial statistics, the attempt to avoid them by producing accurate but rather outdated data will result in failing to satisfy the users' needs. The revisions affect both annual and infra-annual statistics but they are more significant for the infra-annual data.

### 1. *Reasons for revisions of data*

9.16 In general, there are two reasons for revisions - (i) revisions due to "normal" statistical procedures (for instance new information available, change in the methodology, change in data source, change of base year); and (ii) revisions due to the correction of errors that may occur in source data or in processing. In addition, changes in presentation of statistics should be mentioned. They do not, strictly speaking, fit the definition of revision as a change in value of a statistic. However, they often take place at the same time as revisions, especially revisions caused by changes in concept, definition, and classifications.

9.17 It is recommended that corrections of errors (statistical or data processing errors) are done in a transparent manner as soon as they are detected. The revisions should be explained to the users in a way that that gives assurance that mistakes were not politically

motivated. For normal statistical data revisions countries should developed revision policy. The development of a revision policy should not aim at impeding revisions but rather it should aim at providing users with the necessary information to cope with revisions in a more systematic manner. Essential features of a well-established revision policy are its predetermine schedule, reasonably stable from year to year; openness; advance notice of reasons and effects; easy access of users to sufficiently long time series of revised data as well as adequate documentation of revisions included in the statistical publications and databases. Users will be reassured if they see that revisions take place within the framework of an overall policy and according to predetermined scheduled.

## 2. *Recommended practices for data revisions*

9.18 There is a need for the good practices with regard to the data revisions to be followed by countries as it will not only help the national users of the data but also promote international consistency. It is recommended that the following revisions practices[1] should be followed by countries:

(i) it is important to consult main users of official statistics to identify needs and priorities specific to individual countries;

(ii) a statement by the national statistics office about the reasons and scheduled revisions should be made public and readily accessible to users;

(iii) the revision cycle should be relatively stable from year to year. Users place great importance to a revision schedule that is regular;

(iv) major conceptual and methodological revisions should usually be introduced every four to six years, balancing need for change and users' concerns;

(v) revisions should be carried back several years to give consistent time series;

(vi) Details of revisions should be documentation and made available to users. The basic documentation should include identifying in the statistical publications data that are preliminary (or provisional) and revised data, explaining the sources of revisions, and explaining breaks in series when consistent series can not be constructed.

(vii) Users should be reminded of the size of the likely revisions based on past history;

[1] OECD (2007): Data and metadata reporting and presentation handbook.

## C Dissemination formats

9.19 The industrial statistics can be disseminated both electronically (on-line or on CD-ROMs) and in paper publications. It is recommended that countries choose the dissemination format that suits their users' needs best. For example, press releases of industrial statistics have to be disseminated in ways that facilitate re-dissemination by mass media; more comprehensive or detailed statistics have to be disseminated in paper and/or electronic formats. If resources permit, current statistics and longer time series can be organized and accessed (free of charge or for a fee) through the electronic databases maintained by the national statistical office. In addition to statistics routinely disseminated, statistical offices can make available to users the requisite data on request. For some specific purposes customized tabulations of data (non-standard activity classification, specific types of units etc.) can be provided. It is recommended that countries make well known to users the availability of additional statistics and the procedures for obtaining them.

9.20 *Dissemination of metadata.* The metadata and quality assessment of industrial statistics is as important to users as the data. Countries are encouraged to develop and disseminate metadata comprising the following components: (i) data coverage, periodicity and timeliness; (ii) access by the public; (iii) integrity of disseminated data; (iv) data quality; (v) summary methodology; and (vi) dissemination formats All deviations from internationally accepted statistical standards and guidelines should clearly be indicated. The industrial statistics metadata may readily be made accessible through statistical offices websites and/or publications. Countries may consider development of different levels of metadata detail so to meet the requirements and needs of specialized users

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# Annex 1

## Annex 1: Economic activities in terms of ISIC Rev 4 within the scope of industrial statistics

| Section | Division | Group | Class | Description |
|---|---|---|---|---|
| **B** | **Mining and quarrying** | | | |
| | *05* | | | *Mining of coal and lignite* |
| | | 051 | | Mining of hard coal |
| | | | 0510 | Mining of hard coal |
| | | 052 | | Mining of lignite |
| | | | 0520 | Mining of lignite |
| | *06* | | | *Extraction of crude petroleum and natural gas* |
| | | 061 | | Extraction of crude petroleum |
| | | | 0610 | Extraction of crude petroleum |
| | | 062 | | Extraction of natural gas |
| | | | 0620 | Extraction of natural gas |
| | *07* | | | *Mining of metal ores* |
| | | 071 | | Mining of iron ores |
| | | | 0710 | Mining of iron ores |
| | | 072 | | Mining of non-ferrous metal ores |
| | | | 0721 | Mining of uranium and thorium ores |
| | | | 0729 | Mining of other non-ferrous metal ores |
| | *08* | | | *Other mining and quarrying* |
| | | 081 | | Quarrying of stone, sand and clay |
| | | 089 | | Mining and quarrying n.e.c. |
| | | | 0891 | Mining of chemical and fertilizer minerals |
| | | | 0892 | Extraction of peat |
| | | | 0893 | Extraction of salt |
| | | | 0899 | Other mining and quarrying n.e.c. |
| | *09* | | | *Mining support service activities* |
| | | 091 | | Support activities for petroleum and natural gas extraction |
| | | | 0910 | Support activities for petroleum and natural gas extraction |
| | | 099 | | Support activities for other mining and quarrying |
| | | | 0990 | Support activities for other mining and quarrying |
| **C** | **Manufacturing** | | | |
| | 10 | | | Manufacture of food products |
| | | 101 | | Processing and preserving of meat |
| | | | 1010 | Processing and preserving of meat |
| | | 102 | | Processing and preserving of fish, crustaceans and molluscs |
| | | | 1020 | Processing and preserving of fish, crustaceans and molluscs |
| | | 103 | | Processing and preserving of fruit and vegetables |
| | | | 1030 | Processing and preserving of fruit and vegetables |
| | | 104 | | Manufacture of vegetable and animal oils and fats |

| Section | Division | Group | Class | Description |
|---|---|---|---|---|
| | | | 1040 | Manufacture of vegetable and animal oils and fats |
| | | 105 | | Manufacture of dairy products |
| | | | 1050 | Manufacture of dairy products |
| | | 106 | | Manufacture of grain mill products, starches and starch products |
| | | | 1061 | Manufacture of grain mill products |
| | | | 1062 | Manufacture of starches and starch products |
| | | 107 | | Manufacture of other food products |
| | | | 1071 | Manufacture of bakery products |
| | | | 1072 | Manufacture of sugar |
| | | | 1073 | Manufacture of cocoa, chocolate and sugar confectionery |
| | | | 1074 | Manufacture of macaroni, noodles, couscous and similar farinaceous products |
| | | | 1075 | Manufacture of prepared meals and dishes |
| | | | 1079 | Manufacture of other food products n.e.c. |
| | | 108 | | Manufacture of prepared animal feeds |
| | | | 1080 | Manufacture of prepared animal feeds |
| | *11* | | | *Manufacture of beverages* |
| | | 110 | | Manufacture of beverages |
| | | | 1101 | Distilling, rectifying and blending of spirits |
| | | | 1102 | Manufacture of wines |
| | | | 1103 | Manufacture of malt liquors and malt |
| | | | 1104 | Manufacture of soft drinks; production of mineral waters and other bottled waters |
| | *12* | | | *Manufacture of tobacco products* |
| | | 120 | | Manufacture of tobacco products |
| | | | 1200 | Manufacture of tobacco products |
| | *13* | | | *Manufacture of textiles* |
| | | 131 | | Spinning, weaving and finishing of text iles |
| | | | 1311 | Preparation and spinning of textile fibres |
| | | | 1312 | Weaving of textiles |
| | | | 1313 | Finishing of textiles |
| | | 139 | | Manufacture of other textiles |
| | | | 1391 | Manufacture of knitted and crocheted fabrics |
| | | | 1392 | Manufacture of made-up textile articles, except apparel |
| | | | 1393 | Manufacture of carpets and rugs |
| | | | 1394 | Manufacture of cordage, rope, twine and netting |
| | | | 1399 | Manufacture of other textiles n.e.c. |
| | *14* | | | *Manufacture of wearing apparel* |
| | | 141 | | Manufacture of wearing apparel, except fur apparel |
| | | | 1410 | Manufacture of wearing apparel, except fur apparel |
| | | 142 | | Manufacture of articles of fur |
| | | | 1420 | Manufacture of articles of fur |
| | | 143 | | Manufacture of knitted and crocheted apparel |
| | | | 1430 | Manufacture of knitted and crocheted apparel |
| | *15* | | | *Manufacture of leather and related products* |

| Section | Division | Group | Class | Description |
|---|---|---|---|---|
| | | 151 | | Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur |
| | | | 1511 | Tanning and dressing of leather; dressing and dyeing of fur |
| | | | 1512 | Manufacture of luggage, handbags and the like, saddlery and harness |
| | | 152 | | Manufacture of footwear |
| | | | 1520 | Manufacture of footwear |
| | *16* | | | *Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials* |
| | | 161 | | Sawmilling and planing of wood |
| | | | 1610 | Sawmilling and planing of wood |
| | | 162 | | Manufacture of products of wood, cork, straw and plaiting materials |
| | | | 1621 | Manufacture of veneer sheets and wood-based panels |
| | | | 1622 | Manufacture of builders' carpentry and joinery |
| | | | 1623 | Manufacture of wooden containers |
| | | | 1629 | Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials |
| | *17* | | | *Manufacture of paper and paper products* |
| | | 170 | | Manufacture of paper and paper products |
| | | | 1701 | Manufacture of pulp, paper and paperboard |
| | | | 1702 | Manufacture of corrugated paper and paperboard and of containers of paper and paperboard |
| | | | 1709 | Manufacture of other articles of paper and paperboard |
| | *18* | | | *Printing and reproduction of recorded media* |
| | | 181 | | Printing and service activities related to printing |
| | | | 1811 | Printing |
| | | | 1812 | Service activities related to printing |
| | | 182 | | Reproduction of recorded media |
| | | | 1820 | Reproduction of recorded media |
| | *19* | | | *Manufacture of coke and refined petroleum products* |
| | | 191 | | Manufacture of coke oven products |
| | | | 1910 | Manufacture of coke oven products |
| | | 192 | | Manufacture of refined petroleum products |
| | | | 1920 | Manufacture of refined petroleum products |
| | *20* | | | *Manufacture of chemicals and chemical products* |
| | | 201 | | Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms |
| | | | 2011 | Manufacture of basic chemicals |
| | | | 2012 | Manufacture of fertilizers and nitrogen compounds |
| | | | 2013 | Manufacture of plastics and synthetic rubber in primary forms |
| | | 202 | | Manufacture of other chemical products |
| | | | 2021 | Manufacture of pesticides and other agrochemical products |
| | | | 2022 | Manufacture of paints, varnishes and similar coatings, printing ink and mastics |
| | | | 2023 | Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations |

| Section | Division | Group | Class | Description |
|---|---|---|---|---|
| | | | 2029 | Manufacture of other chemical products n.e.c. |
| | | 203 | | Manufacture of man-made fibres |
| | | | 2030 | Manufacture of man-made fibres |
| | *21* | | | *Manufacture of pharmaceuticals, medicinal chemical and botanical products* |
| | | 210 | | Manufacture of pharmaceuticals, medicinal chemical and botanical products |
| | | | 2100 | Manufacture of pharmaceuticals, medicinal chemical and botanical products |
| | *22* | | | *Manufacture of rubber and plastics products* |
| | | 221 | | Manufacture of rubber products |
| | | | 2211 | Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres |
| | | | 2219 | Manufacture of other rubber products |
| | | 222 | | Manufacture of plastics products |
| | | | 2220 | Manufacture of plastics products |
| | *23* | | | *Manufacture of other non-metallic mineral products* |
| | | 231 | | Manufacture of glass and glass products |
| | | | 2310 | Manufacture of glass and glass products |
| | | 239 | | Manufacture of non-metallic mineral products n.e.c |
| | | | 2391 | Manufacture of refractory products |
| | | | 2392 | Manufacture of clay building materials |
| | | | 2393 | Manufacture of other porcelain and ceramic products |
| | | | 2394 | Manufacture of cement, lime and plaster |
| | | | 2395 | Manufacture of articles of concrete, cement and plaster |
| | | | 2396 | Cutting, shaping and finishing of stone |
| | | | 2399 | Manufacture of other non-metallic mineral products n.e.c. |
| | *24* | | | *Manufacture of basic metals* |
| | | 241 | | Manufacture of basic iron and steel |
| | | | 2410 | Manufacture of basic iron and steel |
| | | 242 | | Manufacture of basic precious and other non-ferrous metals |
| | | | 2420 | Manufacture of basic precious and other non-ferrous metals |
| | | 243 | | Casting of metals |
| | | | 2431 | Casting of iron and steel |
| | | | 2432 | Casting of non-ferrous metals |
| | *25* | | | *Manufacture of fabricated metal products, except machinery and equipment* |
| | | 251 | | Manufacture of structural metal products, tanks, reservoirs and steam generators |
| | | | 2511 | Manufacture of structural metal products |
| | | | 2512 | Manufacture of tanks, reservoirs and containers of metal |
| | | | 2513 | Manufacture of steam generators, except central heating hot water boilers |
| | | 252 | | Manufacture of weapons and ammunition |
| | | | 2520 | Manufacture of weapons and ammunition |
| | | 259 | | Manufacture of other fabricated metal products; metalworking service activities |
| | | | 2591 | Forging, pressing, stamping and roll-forming of metal; powder metallurgy |
| | | | 2592 | Treatment and coating of metals; machining |

| Section | Division | Group | Class | Description |
|---|---|---|---|---|
| | | | 2593 | Manufacture of cutlery, hand tools and general hardware |
| | | | 2599 | Manufacture of other fabricated metal products n.e.c. |
| | *26* | | | *Manufacture of computer, electronic and optical products* |
| | | 261 | | Manufacture of electronic components and boards |
| | | | 2610 | Manufacture of electronic components and boards |
| | | 262 | | Manufacture of computers and peripheral equipment |
| | | | 2620 | Manufacture of computers and peripheral equipment |
| | | 263 | | Manufacture of communication equipment |
| | | | 2630 | Manufacture of communication equipment |
| | | 264 | | Manufacture of consumer electronics |
| | | | 2640 | Manufacture of consumer electronics |
| | | 265 | | Manufacture of measuring, testing, navigating and control equipment; watches and clocks |
| | | | 2651 | Manufacture of measuring, testing, navigating and control equipment |
| | | | 2652 | Manufacture of watches and clocks |
| | | 266 | | Manufacture of irradiation, electro-medical and electrotherapeutic equipment |
| | | | 2660 | Manufacture of irradiation, electro-medical and electrotherapeutic equipment |
| | | 267 | | Manufacture of optical instruments and photographic equipment |
| | | | 2670 | Manufacture of optical instruments and photographic equipment |
| | | 268 | | Manufacture of magnetic and optical media |
| | | | 2680 | Manufacture of magnetic and optical media |
| | *27* | | | *Manufacture of electrical equipment* |
| | | 271 | | Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus |
| | | | 2710 | Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus |
| | | 272 | | Manufacture of batteries and accumulators |
| | | | 2720 | Manufacture of batteries and accumulators |
| | | 273 | | Manufacture of wiring and wiring devices |
| | | | 2731 | Manufacture of fibre optic cables |
| | | | 2732 | Manufacture of other electronic and electric wires and cables |
| | | | 2733 | Manufacture of wiring devices |
| | | 274 | | Manufacture of electric lighting equipment |
| | | | 2740 | Manufacture of electric lighting equipment |
| | | 275 | | Manufacture of domestic appliances |
| | | | 2750 | Manufacture of domestic appliances |
| | | 279 | | Manufacture of other electrical equipment |
| | | | 2790 | Manufacture of other electrical equipment |
| | *28* | | | *Manufacture of machinery and equipment n.e.c.* |
| | | 281 | | Manufacture of general-purpose machinery |
| | | | 2811 | Manufacture of engines and turbines, except aircraft, vehicle and cycle engines |
| | | | 2812 | Manufacture of fluid power equipment |
| | | | 2813 | Manufacture of other pumps, compressors, taps and valves |
| | | | 2814 | Manufacture of bearings, gears, gearing and driving elements |
| | | | 2815 | Manufacture of ovens, furnaces and furnace burners |

| Section | Division | Group | Class | Description |
|---|---|---|---|---|
| | | | 2816 | Manufacture of lifting and handling equipment |
| | | | 2817 | Manufacture of office machinery and equipment (except computers and peripheral equipment) |
| | | | 2818 | Manufacture of power-driven hand tools |
| | | | 2819 | Manufacture of other general-purpose machinery |
| | | 282 | | Manufacture of special-purpose machinery |
| | | | 2821 | Manufacture of agricultural and forestry machinery |
| | | | 2822 | Manufacture of metal-forming machinery and machine tools |
| | | | 2823 | Manufacture of machinery for metallurgy |
| | | | 2824 | Manufacture of machinery for mining, quarrying and construction |
| | | | 2825 | Manufacture of machinery for food, beverage and tobacco processing |
| | | | 2826 | Manufacture of machinery for textile, apparel and leather production |
| | | | 2829 | Manufacture of other special-purpose machinery |
| | *29* | | | *Manufacture of motor vehicles, trailers and semi-trailers* |
| | | 291 | | Manufacture of motor vehicles |
| | | | 2910 | Manufacture of motor vehicles |
| | | 292 | | Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semitrailers |
| | | | 2920 | Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semitrailers |
| | | 293 | | Manufacture of parts and accessories for motor vehicles |
| | | | 2930 | Manufacture of parts and accessories for motor vehicles |
| | *30* | | | *Manufacture of other transport equipment* |
| | | 301 | | Building of ships and boats |
| | | | 3011 | Building of ships and floating structures |
| | | | 3012 | Building of pleasure and sporting boats |
| | | 302 | | Manufacture of railway locomotives and rolling stock |
| | | | 3020 | Manufacture of railway locomotives and rolling stock |
| | | 303 | | Manufacture of air and spacecraft and related machinery |
| | | | 3030 | Manufacture of air and spacecraft and related machinery |
| | | 304 | | Manufacture of military fighting vehicles |
| | | | 3040 | Manufacture of military fighting vehicles |
| | | 309 | | Manufacture of transport equipment n.e.c. |
| | | | 3091 | Manufacture of motorcycles |
| | | | 3092 | Manufacture of bicycles and invalid carriages |
| | | | 3099 | Manufacture of other transport equipment n.e.c. |
| | *31* | | | *Manufacture of furniture* |
| | | 310 | | Manufacture of furniture |
| | | | 3100 | Manufacture of furniture |
| | *32* | | | *Other manufacturing* |
| | | 321 | | Manufacture of jewellery, bijouterie and related articles |
| | | | 3211 | Manufacture of jewellery and related articles |
| | | | 3212 | Manufacture of imitation jewellery and related articles |
| | | 322 | | Manufacture of musical instruments |

| Section | Division | Group | Class | Description |
|---|---|---|---|---|
| | | | 3220 | Manufacture of musical instruments |
| | | 323 | | Manufacture of sports goods |
| | | | 3230 | Manufacture of sports goods |
| | | 324 | | Manufacture of games and toys |
| | | | 3240 | Manufacture of games and toys |
| | | 325 | | Manufacture of medical and dental instruments and supplies |
| | | | 3250 | Manufacture of medical and dental instruments and supplies |
| | | 329 | | Other manufacturing n.e.c. |
| | | | 3290 | Other manufacturing n.e.c. |
| | *33* | | | *Repair and installation of machinery and equipment* |
| | | 331 | | Repair of fabricated metal products, machinery and equipment |
| | | | 3311 | Repair of fabricated metal products |
| | | | 3312 | Repair of machinery |
| | | | 3313 | Repair of electronic and optical equipment |
| | | | 3314 | Repair of electrical equipment |
| | | | 3315 | Repair of transport equipment, except motor vehicles |
| | | | 3319 | Repair of other equipment |
| | | 332 | | Installation of industrial machinery and equipment |
| | | | 3320 | Installation of industrial machinery and equipment |
| **D** | **Electricity, gas, steam and air conditioning supply** | | | |
| | *35* | | | *Electricity, gas, steam and air conditioning supply* |
| | | 351 | | Electric power generation, transmission and distribution |
| | | | 3510 | Electric power generation, transmission and distribution |
| | | 352 | | Manufacture of gas; distribution of gaseous fuels through mains |
| | | | 3520 | Manufacture of gas; distribution of gaseous fuels through mains |
| | | 353 | | Steam and air conditioning supply |
| | | | 3530 | Steam and air conditioning supply |
| **E** | **Water supply; sewerage, waste management and remediation activities** | | | |
| | *36* | | | *Water collection, treatment and supply* |
| | | 360 | | Water collection, treatment and supply |
| | | | 3600 | Water collection, treatment and supply |
| | *37* | | | Sewerage |
| | | 370 | | Sewerage |
| | | | 3700 | Sewerage |
| | *38* | | | Waste collection, treatment and disposal activities; materials recovery |
| | | 381 | | Waste collection |
| | | | 3811 | Collection of non-hazardous waste |
| | | | 3812 | Collection of hazardous waste |
| | | 382 | | Waste treatment and disposal |
| | | | 3821 | Treatment and disposal of non-hazardous waste |
| | | | 3822 | Treatment and disposal of hazardous waste |
| | | 383 | | Materials recovery |
| | | | 3830 | Materials recovery |

| Section | Division | Group | Class | Description |
|---|---|---|---|---|
| | *39* | | | Remediation activities and other waste management services |
| | | 390 | | Remediation activities and other waste management services |
| | | | 3900 | Remediation activities and other waste management services |

# Annex 2

## Annex 2: Identifying the principal activity of a statistical unit using the top-down method

### *The "top-down" method*

The top-down method follows a hierarchical principle: the classification of a unit at the lowest level of the classification must be consistent with the classification of the unit at the higher levels. To satisfy this condition the process starts with the identification of the relevant category at the highest level and progresses down through the levels of the classification in the following way:

Step 1 - Identify the section which has the highest share of the value added
Step 2 - Within this section identify the division which has the highest share of the value added within this section
Step 3 - Within this division identify the group which has the highest share of the valued added within this division (see below for exception in the case of wholesale and retail trade activities)
Step 4 - Within this group identify the class which has the highest share of value added within this group

The application of this principle has been demonstrated with the following example:

Example: A reporting unit may carry out the following activities:

| Section | Division | Group | Class | Description of the class | Share of value added (per cent) |
|---|---|---|---|---|---|
| C | 25 | 251 | 2512 | Manufacture of tanks, reservoirs and containers of metal | 7 |
| | 28 | 281 | 2816 | Manufacture of lifting and handling equipment | 8 |
| | | 282 | 2821 | Manufacture of agricultural and forestry machinery | 3 |
| | | | 2822 | Manufacture of metal-forming machinery and machine tools | 21 |
| | | | 2824 | Manufacture of machinery for mining, quarrying and construction | 8 |
| | 29 | 293 | 2930 | Manufacture of parts and accessories for motor vehicles | 5 |
| G | 46 | 461 | 4610 | Wholesale on a fee or contract basis | 7 |
| | | 465 | 4659 | Wholesale of other machinery and equipment | 28 |
| M | 71 | 711 | 7110 | Architectural and engineering activities and related technical consultancy | 13 |

The principal activity is then determined as follows:

*Step 1. Identify the section*

| Section | Description | Share of value added (per cent) |
|---|---|---|
| Section C | Manufacturing | **52** |
| Section G | Wholesale and retail trade; repair of motor vehicles and motorcycles | 35 |
| Section M | Professional, scientific and technical activities | 13 |

*Step 2. Identify the division (within section C)*

| Division | Description | Share of value added (per cent) |
|---|---|---|
| Division 25 | Manufacture of fabricated metal products, except machinery and equipment | 7 |
| Division 28 | Manufacture of machinery and equipment n.e.c. | **40** |
| Division 29 | Manufacture of motor vehicles, trailers and semi-trailers | 5 |

*Step 3. Identify the group (within division 28)*

| Group | Description | Share of value added (per cent) |
|---|---|---|
| Group 281 | Manufacture of general-purpose machinery | 8 |
| Group 282 | Manufacture of special-purchase machinery | **32** |

*Step 4. Identify the class (within group 282)*

| Class | Description | Share of value added (per cent) |
|---|---|---|
| Class 2821 | Manufacture of agricultural and forestry machinery | 3 |
| Class 2822 | Manufacture of metal-forming machinery and machine tools | **21** |
| Class 2824 | Manufacture of machinery for mining, quarrying and construction | 8 |

The principal activity is therefore **2822: Manufacture of metal-forming machinery and machine tools**, although the class with the biggest share of value added is class 4659: Wholesale of other machinery and equipment.

If a "bottom-up" approach is used, the reporting unit would be classified to wholesale trade in class 4659 (wholesale of other machinery and equipment), based on the single largest share of value added at the class level. This would result in a reporting unit with a value added share of 52 per cent in manufacturing being classified outside of manufacturing.