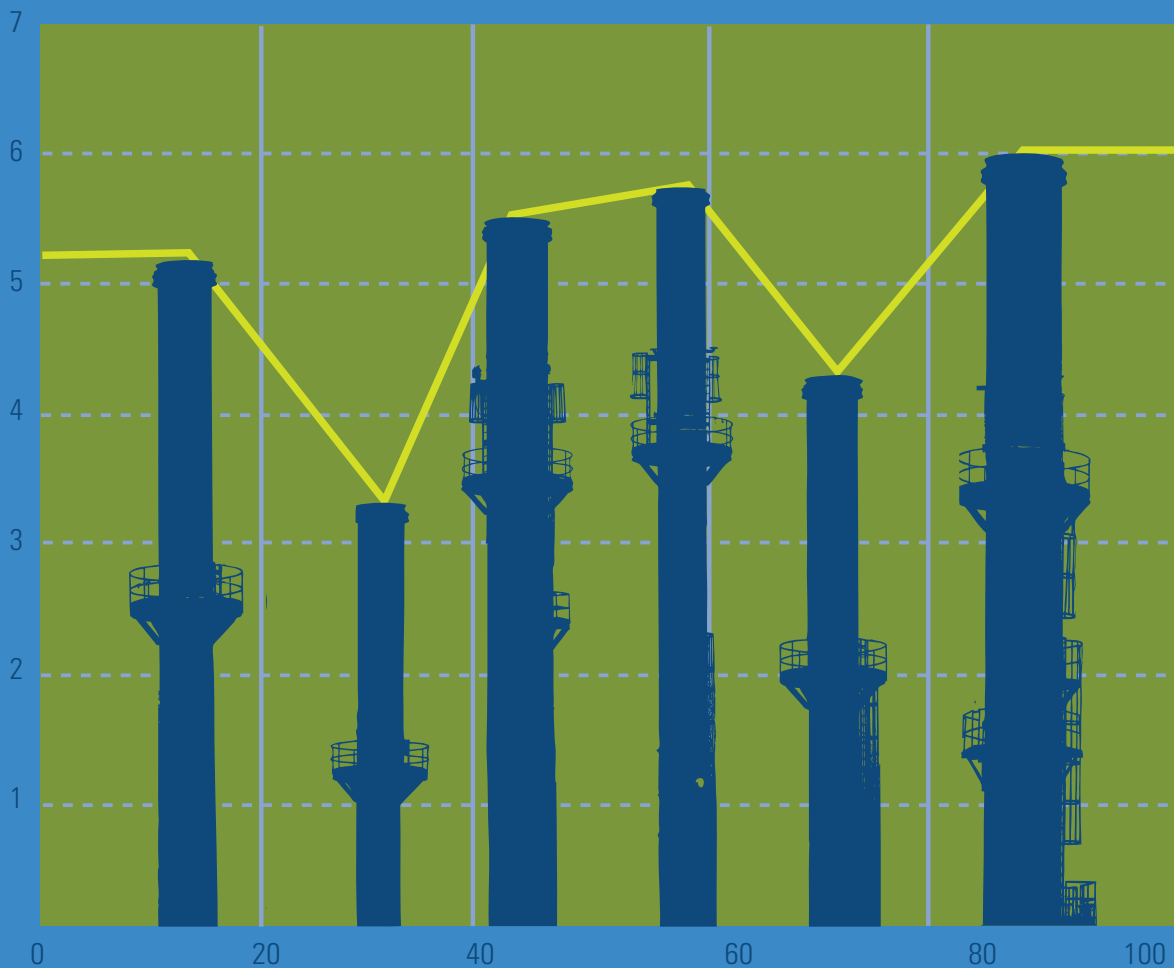


International Recommendations for Industrial Statistics 2008



Department of Economic and Social Affairs
Statistics Division

Statistical papers

Series M No. 90

International Recommendations for Industrial Statistics

2008



United Nations
New York, 2009

Department of Economic and Social Affairs

The Department of Economic and Social Affairs of the United Nations Secretariat is a vital interface between global policies in the economic, social and environmental spheres and national action. The Department works in three main interlinked areas: (i) it compiles, generates and analyses a wide range of economic, social and environmental data and information on which States Members of the United Nations draw to review common problems and to take stock of policy options; (ii) it facilitates the negotiations of Member States in many intergovernmental bodies on joint courses of action to address ongoing or emerging global challenges; and (iii) it advises interested Governments on the ways and means of translating policy frameworks developed in United Nations conferences and summits into programmes at the country level and, through technical assistance, helps build national capacities.

Note

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

ST/ESA/STAT/SER.M/90

United Nations publication

Sales No. E.08.XVII.8

ISBN 978-92-1-161511-1

Copyright © United Nations, 2009

All rights reserved

Printed at the United Nations, New York

Preface

With a view to establishing a uniform pattern for the measurement of economic activities on a comparable basis, international recommendations have been formulated by the United Nations for the collection of statistics on a number of economic activities.¹ The international recommendations for industrial statistics were first formulated in 1953² and revised from time to time, the last revision having been undertaken in 1983.³

The United Nations Statistical Commission at its thirty-seventh session in 2006⁴ had endorsed the proposal for a revision of the international recommendations for industrial statistics (IRIS) that would reflect the latest developments in the economic environment and statistical methodology. The provisional draft of IRIS was prepared following the conclusions of the first meeting of the Expert Group on Industrial Statistics held in New York from 19 to 23 September 2005. The draft was reviewed and endorsed by the Expert Group at its second meeting held from 16 to 19 July 2007. With a view to promoting transparency and the participation of the international statistical community in formulating international recommendations, the draft IRIS was circulated to national statistical offices, the regional commissions and international organizations during November 2006–December 2007 for their substantive comments and other observations. Their inputs received through this global consultation were incorporated in the draft. Moreover, from the consultation emerged an overwhelmingly enthusiastic international endorsement of the revised recommendations, to be issued as IRIS 2008.

The Statistical Commission, at its thirty-ninth session, held in New York from 26 to 29 February 2008, adopted part I of the draft IRIS 2008, containing the recommendations for statistical units, characteristics of statistical units, data items and their definitions and the data items for international reporting, as the international recommendations for industrial statistics.⁵ The Commission also endorsed part II of the document, containing guidance on performance indicators, data sources and data compilation methods, data-collection strategy, data quality and metadata, and dissemination of industrial statistics, as supplementary guidance for the implementation of the international recommendations.⁶

The present publication is a component of the United Nations Statistics Division initiative for strengthening countries methodological and operational foundation for industrial statistics as built up through the World Programme of Industrial Statistics in particular and the development of economic statistics in an integrated manner in general. It may also be viewed as representing a useful step towards developing an integrated approach to economic statistics by national statistical systems, as reflected in the full alignment of IRIS 2008 with the System of National Accounts and other international recommendations for basic economic statistics by economic activities. More specifically, although this publication makes recommendations for industrial statistics, many elements of its recommendations, like those for the definition and delineation of statistical units and its guidance on a data-collection strategy and data compilation practices, are generally applicable to the development of an integrated economic statistics system for business statistics in general, with a view to collecting,

¹ *International Recommendations for Construction Statistics*, Statistical Papers, No. 47, Rev.1 (United Nations publication, Sales No. E.97.XVII.11), also available from http://unstats.un.org/unsd/publication/SeriesM/SeriesM_47rev1E.pdf; and *International Recommendations for Distributive Trade Statistics 2008*, Statistical Papers, No. 89 (United Nations publication, Sales No. E.08.XVII.26).

² *International Standards in Basic Industrial Statistics*, Statistical Papers, No. 17 (United Nations publication, Sales No. E.1953.XVII.7).

³ *International Recommendations for Industrial Statistics*, Statistical Papers, No. 48, Rev.1 (United Nations publication, Sales No. E.83.XVII.8).

⁴ See *Official Records of the Economic and Social Council, 2006, Supplement No. 4 (E/2006/24)*, chap. I.C, decision 37/101, para. 3 (c). The report of the Statistical Commission is also available from <http://unstats.un.org/unsd/statcom/doc06/Report-English.pdf>.

⁵ *Ibid.*, 2008, *Supplement No. 4 (E/2008/30)*, chap. I.B, decision 39/108, para. (b). The report of the Statistical Commission on its thirty-ninth session is also available from <http://unstats.un.org/unsd/statcom/doc08/DraftReport-English.pdf>.

⁶ *Ibid.*, para. (c).

⁷ See the report of the Friends of the Chair on integrated economic statistics (E/CN.3/2008/6), presented at the thirty-ninth session of the United Nations Statistical Commission, also available from <http://unstats.un.org/unsd/statcom/doc08/2008-6-IntegratedEcoStats-E.pdf>.

compiling and reporting basic economic data across economic activities, in the most cost-efficient manner, consistent with macroeconomic statistics.⁷

This publication is designed to provide a comprehensive methodological framework for the collection and reporting of industrial statistics in all countries, irrespective of the level of development of their statistical systems. 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, but may be also useful to researchers and other users of industrial statistics.

Acknowledgements

The *International Recommendations for Industrial Statistics 2008* were prepared by the United Nations Statistics Division. Throughout the process of the development of IRIS 2008, guidance was provided by the Expert Group on Industrial Statistics. Members of the Expert Group included (in alphabetical order of countries): Peter Harper and Paul Sullivan (Australia); André Luiz Macedo and Cristiano R. Santos (Brazil); Guergana Maeva (Bulgaria); Fandio Tchabo Ferdinand (Cameroon); Michel Girard, Marie Brodeur, Alice Born and Peter Lys (Canada); Alain Gallais (France); Roland Gnos (Germany); Krakah Anthony (Ghana); Swaraj K. Nath and Prashanta K. Ray (India); Tadayoshi Hiraki and Hiroaki Sumida (Japan); Dong Wook Jeong, Kwang Sup Kim and Sung Wook Choi (Korea, Republic of); Violeta Kunigeliene (Lithuania); Suan See Tay (Malaysia); Jaime Andres de la Llata-Flores (Mexico); Antonius Platteel (Netherlands); Solomon Olaye (Nigeria); Igor Uliyanov (Russian Federation); Wong Wee Kim, Chua Kia Chee and Cheng Wai San (Singapore); Edward Morgan (United States of America); Andreas Lindner (Organization for Economic Cooperation and Development); and Tetsuo Yamada and Shyam Upadhyaya (United Nations Industrial Development Organization). Inputs were also received from Alope Kar and Savio Giovanni (Economic and Social Commission for Western Asia).

The guidance of the Statistical Commission and the active participation of the national statistical offices, the regional commissions, the international organizations and the individual experts were vital during the preparation of this publication.

The preparation of IRIS 2008 and the organization of the meetings of the Expert Group on Industrial Statistics were undertaken under the general guidance and supervision of Ivo Havinga. Gulab Singh was directly responsible for drafting of this publication, organization of the meetings of the Expert Group and the global consultations, in collaboration with Viet Vu. Collaboration with Youlia Antonova, who was responsible for the preparation of the text of the *International Recommendations for Distributive Trade Statistics 2008*, ensured that the texts on common principles, concepts and definitions in the two documents were aligned.

Contents

	<i>Page</i>
Introduction	1
Part One. International recommendations	
<i>Chapter</i>	
I. Scope of industrial statistics	11
A. Economic activity.....	11
B. Integrated nature of economic activities	11
C. Scope and structure of the industrial sector in the present publication.....	12
D. General description of economic activities covered in this publication	12
1. Mining and quarrying (sect. B of ISIC, Rev.4)	12
2. Manufacturing (sect. C of ISIC, Rev.4)	13
3. Electricity, gas, steam and air-conditioning supply (sect. D of ISIC, Rev.4)	14
4. Water supply; sewerage, waste management and remediation activities (sect. E of ISIC, Rev.4)	14
E. Outsourcing: the boundary between manufacturing and wholesaling	14
1. Outsourcing of support functions	15
2. Outsourcing of parts of the production process	15
3. Outsourcing of the complete production process	15
F. Coverage of industrial activities	16
G. Scope of the industrial sector in terms of the Central Product Classification (CPC).....	17
II. Statistical units	19
A. Overview	19
B. Statistical units	20
C. Legal entities	21
D. Types of statistical units	21
1. Institutional units	21
2. Enterprise group	23
3. Enterprise	24
4. Establishment.....	24
5. Other statistical units	25
(a) Kind-of-activity unit	25
(b) Local unit.....	26
(c) Local kind-of-activity unit	27
(d) Ancillary unit	27
(e) Multi-territory enterprises	29
E. Statistical units for industrial statistics.....	31
F. Statistical units of the informal sector	33

<i>Chapter</i>	<i>Page</i>
III. Characteristics of statistical units	35
A. Identification code	35
B. Location	36
C. Kind of activity	36
D. Type of economic organization	39
E. Type of legal organization and ownership	39
F. Size	43
G. Demographic characteristics	44
IV. Data items and their definitions	45
A. Understanding the links between business accounting and business statistics	45
1. Differences in terminology	45
2. Differences in business accounting rules	46
B. List of data items	46
C. Definitions of data items	54
1. Demography	54
(a) Characteristics of statistical units	54
(b) Number of statistical units	54
2. Employment	55
(a) Number of persons employed	55
(b) Average number of persons employed	62
(c) Hours worked	63
3. Compensation of employees	65
4. Other expenditures	69
(a) Purchases of goods and services	69
(b) Data items on quantity	75
5. Turnover, sales, shipments, receipts for services and other revenues (excluding property income)	77
(a) Turnover, sales, shipments, receipts for services and other revenues	77
(b) E-commerce	82
(c) Data items on quantity	82
6. Inventories	83
7. Taxes and subsidies	85
8. Output	86
9. Intermediate consumption and census input	87
10. Value added	88
11. Assets, capital expenditures, retirements and depreciation	89
12. Orders	95
13. Environmental protection	95
D. Data items for international reporting	96
1. Data items for international reporting with annual periodicity	96
2. Data items for international reporting with quarterly periodicity	96

<i>Chapter</i>	<i>Page</i>
Part Two. Guidance for implementation	
V. Performance indicators	101
A. Performance indicators and their use.....	101
B. Objectives of performance indicators.....	101
C. Types of performance indicators.....	102
1. Growth rates.....	102
2. Ratio indicators	103
3. Share indicators.....	104
VI. Data sources and data compilation methods	105
A. Data sources	105
1. Administrative sources	105
2. Statistical surveys	107
B. Data compilation methods	109
1. Data validation and editing.....	109
2. Imputations	111
3. Grossing up procedures; aggregation.....	113
VII. Data-collection strategy	115
A. The business register as a statistical frame for industrial inquiries....	115
1. Purpose of the business register	116
2. Creation and maintenance of the business register.....	116
B. Data-collection strategy	119
C. Survey method	121
D. Scope and coverage of various inquiries.....	125
1. Annual inquiry	125
2. Infra-annual inquiry.....	125
3. Infrequent inquiry.....	125
4. Baseline inquiry for the non-list-frame segment.....	126
E. Reconciling the results of infrequent or annual benchmark surveys with infra-annual surveys.....	126
F. Reference period.....	127
VIII. Data quality and metadata	129
A. Enhancing the quality of industrial statistics	129
Dimensions of quality	130
B. Quality indicators versus direct quality measures	133
C. Metadata on industrial statistics	134
IX. Dissemination of industrial statistics	137
A. Dissemination.....	137
1. Statistical confidentiality.....	137
2. Equality.....	139
3. Objectivity	139
B. Data revisions.....	139
1. Reasons for revisions of data.....	140
2. Best practices for data revisions	140
C. Dissemination formats	141

	<i>Page</i>
Annexes	
I. Economic activities in terms of the International Standard Industrial Classification of All Economic Activities, Revision 4, within the scope of industrial statistics	145
II. Identifying the principal activity of a statistical unit using the top-down method	153
References	155
Box	
II.1. Output of the ancillary activity and its allocation to establishments.	30
Figures	
II.1. Relationships between different types of statistical units.	28
VII.1. A typical hierarchic relationship to be identified in the business register. . .	119
VII.2. Data-collection strategy for different segments of the economy.	120
VIII.1. The relationship between the International Monetary Fund Data Quality Assessment Framework, the Eurostat quality definition and the Organization for Economic Cooperation and Development quality measurement framework	130
Tables	
II.1. Relationship between concepts of activity and location	27
IV.1. Comparison of the concepts of turnover/sales, revenue and receipts.	79
IV.2. List of data items on industrial statistics for international dissemination with annual periodicity.	96
IV.3. List of data items on industrial statistics for international dissemination with quarterly periodicity.	97
VIII.1. Minimum set of key quality indicators	135

Introduction

Background

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

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

Purpose of the international recommendations

3. The international recommendations for industrial statistics constitute 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 industrial activity. National statistical offices need to assess the applicability of those recommendations to their situation and the practicability of implementing them, taking into account their circumstances, including, for example, identified user needs, resources, priorities and respondent burden.

Need for the revision of the international recommendations

4. The present publication represents a revision of the 1983 recommendations for industrial statistics undertaken in the context of developments that have unfolded in this area during the last 25 years. It takes into account the comprehensive methods adopted by the majority of countries in their approach both to adapting the industrial statistics programme to the requirements of national accounts and to measuring the industrial sector for the economy as a whole. Apart from considering the comprehensive measures adopted to align the industrial sector with national accounts-related needs, this revision provides a harmonization with the revisions of various international statistical standards and regional regulations. The highly important factors that have guided the preparation of this revision are the following:

- (a) Revision of the 1993 System of National Accounts (SNA) entailing changes relevant for industrial statistics in areas including: (i) treatment of goods for processing; (ii) additional elements for the measure of compensation of employees like employee stock options; (iii) recognition of units providing ancillary services as a separate establishment in some specific circumstances; (iv) classification and terminology of assets; (v) capitalization of

database development; and (vi) capitalization of expenditures on research and development, etc.;

- (b) The need for consistency with respect to changes in concepts, definitions and terminology in the major statistical publications and regulations of other international organizations such as the Council of the European Union regulation concerning structural business statistics (Eurostat, 1996); the handbook of the Organization for Economic Cooperation and Development (OECD) on measurement of the non-observed economy and on data and metadata reporting and presentation (OECD, 2002a; 2007b); the resolution adopted by the Fifteenth International Conference of Labour Statisticians on the International Classification of Status in Employment (International Labour Organization (ILO), 1993a); and International Monetary Fund (IMF) publications regarding the treatment of multi-territory enterprises (IMF, 2008);
- (c) Revision of the International Standard Industrial Classification of All Economic Activities (ISIC, Rev.4) (United Nations, 2008c) and the Central Product Classification, Version 2 (CPC, Ver.2) (United Nations, 2008a);
- (d) Globalization of the industrial production process and use of electronic commerce, etc.;
- (e) Efforts of countries to minimize the differences between the concepts of “census value added” through approximation of 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 the valuation of industrial output to basic prices⁸ in accordance with the valuation principle recommended by the 2008 SNA and applied in business accounting;
- (h) Expansion of the link between the economy and the environment by extending the coverage of data items to include the use of natural resources like energy, water, minerals and generation of solid waste and wastewater and by-products.

⁸ The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, by the producer as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer (2008 SNA, paragraph 6.51, available from <http://unstats.un.org/unsd/nationalaccount/SNA2008.pdf>).

Scope and relevance of the international recommendations

5. In line with the International Standard Industrial Classification of All Economic Activities (ISIC), Rev.4, the scope of the industrial sector has been defined as covering mining and quarrying (sect. B); manufacturing (sect. C); electricity, gas, steam and air-conditioning supply (sect. D); and water supply; sewerage, waste management and remediation activities (sect. E). The scope of economic activities has been broadened as compared with that of the international recommendations of 1983: the activities of sewerage, waste collection and remediation were added in line with the broadening of the scope of section E in 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 sets of annual 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 (United Nations, 1968b; 1997) and distributive

trade and services (United Nations, 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 (United Nations and World Tourism Organization, 1994; Commission of the European Communities, Organization for Economic Cooperation and Development, World Tourism Organization and United Nations, 2001).

7. More specifically, 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 levels. By contrast, short-term business statistics are infra-annual⁹ production-related statistics that are collected to monitor the 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 2008 System of National Accounts as the overarching macroeconomic framework. The intermediate output frameworks of business statistics will be based on common methodological principles and common definitions of data items allowing for a coordinated compilation of harmonized statistics with reliability and flexibility and to the level of detail required to meet the needs of Governments, the 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 a quarterly or monthly basis, which are often produced from samples of smaller size. The production figures from structural business surveys, when administered, should be used to generate product data or complemented by specialized commodity production surveys. Whatever the data-collection instruments might be, detailed production data in value and volume are to be internationally reported for an agreed set of industrial commodities¹⁰ for purposes of international comparison. Moreover, they can provide benchmark statistics for analysing 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 according to a strict timetable and users expect that timetable to be respected. Sometimes, this means that initial figures are subsequently revised as more data are collected and analysed. The collection and compilation of the monthly and quarterly indices of industrial production from the infra-annual inquiries are dealt with in a separate publication¹¹ 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 encompassing a system of regular annual and infra-annual general-purpose inquiries covering production-related activities. It can be used, however, for organizing baseline surveys (conducted periodically after fixed intervals of time) based on the area frame for the collection of general-purpose production statistics of small “unregistered” units, especially by countries with a large informal sector that cannot afford annual surveys covering the entire industrial sector. In contrast, inquiries into specialized subjects, whether regular, occasional or irregular, are not dealt with in this publication, which is primarily concerned with statistics appropriate to the establishment or establishment-type unit. Enterprise statistics

⁹ The term “infra-annual” replaces the term “more-frequent-than-annual” as used in the 1983 recommendations.

¹⁰ UN List of Industrial Products (United Nations, 2008b), available from <http://unstats.un.org/unsd/industry/commoditylist2.asp?s=0>.

¹¹ See *International Recommendations for the Index of Industrial Production (2009)*, United Nations publication, Sales No. E.09.XVII.12.

are discussed only to the extent that they manage to 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 of this publication to establish guidelines in this area.

12. This revision of the existing industrial statistics recommendations fully articulates the relationship with the System of National Accounts (SNA) based on the progress of countries in adapting the industrial statistics programmes to the needs of national accounts. In the context of such progress, the present publication deviates from the previous set of 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, could countries opt for continuing its measurement. In contrast, this set of revised international standards recommends the collection of data through annual and infra-annual inquiries by all countries to approximate the national accounts measurement of value added and thereby approximate the contribution of industry to gross domestic product (GDP) 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 or even appropriate with the data items for industrial statistics whose collection is recommended in this publication. Only at the stage of national accounts compilation are macro-adjustments made, for example, for insurance and financial intermediation services, as they are indirectly measured in national accounts and not through direct observation.

13. Extending the measurement of 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 to say, the reference period to which the data relate) in the production of goods and services for sale or exchange.¹²

¹² 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 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 and on the basis of regular annual and infra-annual inquiries rather than infrequent inquiries.

Data items of the international recommendations

15. The infrequent inquiry usually conducted in a 5- to 10-year cycle in the developing countries, besides providing benchmark estimates of general-purpose production statistics, is often used as a tool for creating the area frame of establishments and enterprises. Such estimates are less accurate than those based on regular annual and infra-annual inquiries. Besides, some countries rely on baseline surveys, conducted once in five years, say, for the purpose of collecting production statistics of the “unregistered” units. The present publication recommends, particularly for those countries in the process of developing their industrial statistics, that priority should be given to developing an integrated system of annual and infra-annual inquiries. The use of infrequent surveys for ad hoc specialized inquiries is not dealt with in this publication.

16. The data items and their definitions presented in the previous set of recommendations have basically been maintained in the present publication. On the other hand, data items have been added and definitions revised consistent with the 2008 System of National Accounts. Moreover, the link to the environment and environmental accounting has been extended by broadening the scope of the annual collection of intermediate consumption of quantities and costs of important fuel types in the 1983 recommendations to include (a) important minerals, (b) water extraction for own use and (c) quantities of solid waste and wastewater 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 have not been ranked by assigning priorities of importance based on the various stages of implementation of the recommendations. The approach in the present recommendations is rather to adopt a universal list of data items for which statistics are to be collected and published, a list that is fully harmonized with the needs of national accounts and measurement of the industrial sector for the economy as a whole. As 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, countries are encouraged to adopt them.

18. The recommendations are not intended to be prescriptive but countries are still encouraged to implement them. The countries may choose a particular method for implementation of the recommendations depending upon their own needs and capabilities, including the needs of data users and availability of data through statistical and administrative sources. It is recognized that the industrial statistics system has to balance the need for detailed data on the 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 for a variety of purposes by a variety of users including the government, the business community, researchers and others. One of the most important purposes, undoubtedly, is 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 in great demand by:

- (a) *Policymakers*, 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 provides the necessary impetus for the growth of service activities;
- (b) *The 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 operating units, 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 value

added generated by industrial activities; and (ii) compilation of supply and use tables by product and by industry and input-output tables;

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

Organization of the publication

20. The present publication on international recommendations for industrial statistics comprises two parts and covers all aspects of industrial statistics. Part one 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. Part two includes guidance to help in implementing the international recommendations and covers performance indicators, data sources, compilation methods and data-collection strategy, data quality and dissemination of industrial statistics. The contents are as follows:

Part one. International recommendations

- Chapter I describes the industrial activities in terms of the International Standard Industrial Classification of All Economic Activities (ISIC), Revision 4, and other classifications, discusses boundary issues and defines the scope of industrial statistics.
- Chapter II describes the statistical units that are useful for collection of industrial statistics and economic analysis of the economy.
- Chapter III explains the main characteristics of statistical units required for their unique identification and classification.
- 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 the statistics to be published. It also presents the data items for international reporting with annual and infra-annual periodicities.

Part two. Guidance for implementation

- Chapter V describes a set of main indicators useful for evaluating the performance of the industrial sector.
- Chapter VI discusses the main data sources and methods used for compilation of industrial statistics.
- Chapter VII outlines a strategy for collection of data relating to industrial activities through annual and infra-annual industrial inquiries.
- Chapter VIII discusses data quality and metadata relating to industrial statistics.
- Chapter IX provides guidance and good practices in respect of the dissemination of industrial statistics.
- Annex I presents economic activities in terms of ISIC, Rev.4, within the scope of industrial statistics.
- Annex II provides an example of how to identify the principal activity of a statistical unit using the top-down method.

PART ONE

International recommendations

Chapter I

Scope of industrial statistics

A. Economic activity

1.1. In general, the term “economic activity” is understood as referring to a process, that is to say, to the combination of actions carried out by a certain entity that uses labour, capital, goods and services to produce specific products (goods and services). An activity is characterized by (a) an input of resources; (b) a production process; and (c) an output of products. By convention, a single activity is understood as a process resulting in a homogeneous type of product. 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 a different activity category. For statistical purposes, an entity engaged in a given activity may be treated as either 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 that produce separate products, if either bookkeeping records allow or there exist some statistical methods developed for the purpose of separation; each part of the entity may in this case 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 decomposed for the purpose of surveying only the industrial activities 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 discussed later in chapter II on statistical units, an enterprise that is a manufacturer may also have subunits with their own account of production costs that involve 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 rate lower than the 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 a manufacturing activity that produces goods such as bricks, furniture, etc., that should be classified as manufacturing. In order to ensure that economic activities are not underreported or misclassified, all units in the economy must be first registered and classified properly before surveys are carried out. For units that are difficult to enumerate, such as household and small-scale economic units, a 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 the industrial sector in the present publication

1.3. In general, industrial statistics are statistics reflecting the characteristics and economic activities of 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) (United Nations, 2008c). The term “industry” thus refers to a class of ISIC that encompasses all economic activities including agriculture and services-producing activities within an economy and is therefore much broader than the term “industry” as it is popularly understood, which refers sometimes to manufacturing activities alone and sometimes to a more extended list of activities which may also include 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 active primarily in the following areas:

- (a) Mining and quarrying (sect. B of ISIC, Rev.4);
- (b) Manufacturing (sect. C of ISIC, Rev.4);
- (c) Electricity, gas, steam and air-conditioning supply (sect. D of ISIC, Rev.4);
- (d) Water supply; sewerage, waste management and remediation activities (sect. E of ISIC, Rev.4).

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 and transport.

1.7. Coverage of activities at the most detailed (four-digit) level of ISIC, Rev.4, is presented in annex I. A brief description of the coverage of economic activities within the scope of the industrial sector is given below.

D. General description of economic activities covered in this publication

1. Mining and quarrying (sect. B of ISIC, Rev.4)

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 (sect. C of ISIC, Rev.4)

1.10. This includes the physical or chemical transformation of materials, substances or components into new products, although such a definition cannot be used as the single universal criterion for determining what constitutes manufacturing (see the remark below on processing of waste). The materials, substances or components transformed are raw materials that are products of agriculture, forestry, fishing, mining or quarrying or 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 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 utilization 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 it may involve physical or chemical transformations, is not considered to be a part of manufacturing. However, the manufacture of new final products (as opposed to secondary raw materials), even if the processes involved use waste as an input, is classified in manufacturing. 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 are 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 between manufacturing and 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 a point of clarification, the following activities are considered manufacturing in 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 they sometimes involve 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, classified to section G (Wholesale and retail trade; repair of motor vehicles and motorcycles)

3. Electricity, gas, steam and air-conditioning supply (sect. D of ISIC, Rev.4)

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 is 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 and (typically long-distance) transport of gas through pipelines.

4. Water supply; sewerage, waste management and remediation activities (sect. E of ISIC, Rev.4)

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: the boundary between manufacturing and wholesaling

1.20. The term “outsourcing” of production has been used to refer to a situation where the principal production unit (the principal) contracts another production unit (the contractor) to carry out specific functions constituting the whole or a part of the

principal's activity in producing a good or a service. It should be noted that the activity classification of the contractor is not affected by the fact that the activity has been outsourced, but the activity classification of the principal is very much affected by the nature and extent of the outsourcing.

1.21. The trend of outsourcing manufacturing activities has been growing recently. It is imperative, therefore, that the criteria for the classification of the principal that is outsourcing its economic activity be clarified to ensure international consistency in respect of its classification. It is recommended that the criteria for classification of the principal to manufacturing be based on the principal's sole ownership of the physical input materials.

1.22. Outsourcing can assume three forms, namely (a) outsourcing of support functions, (b) outsourcing of 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 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 that it is carrying out, for example, ISIC class 6920 (Accounting, bookkeeping and auditing activities; tax consultancy) or class 6202 (Computer consultancy and computer facilities management activities).

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 a separate ISIC category. Also, in the case of the 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) 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;
- (b) Outsourcing of manufacturing activities to the contractor, whereby the principal does not physically transform the goods at the location of its unit, in which case the following activity classifications apply:
 - (i) A principal that owns the material inputs and thereby has economic ownership of the outputs, but has the production carried out by

- others, is classified to section C (Manufacturing) of ISIC Rev.4, specifically to the classification category that corresponds to the complete (outsourced) manufacturing activity;
- (ii) A principal that has the production carried out 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) of ISIC Rev.4, specifically to the classification category that corresponds to the activity represented by the type of sale (for example, wholesale or retail sale) and type of good sold. In this case, it should also be determined whether 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;
 - (iii) The contractor in such a case is classified to section C (Manufacturing) of ISIC Rev.4, specifically to the classification category that corresponds to the manufacturing activity performed by the contractor.

F. Coverage of industrial activities

1.26. The field of industrial statistics could be covered in terms of activities or of establishments. It is desirable, of course, that all industrial activities be covered, including the minor industrial activities of establishments that are predominantly non-industrial, and some countries aim at such coverage. However, a difficulty usually arises from the fact that separate statistics for the industrial part of an establishment engaged in mixed activities may not be available because of the nature of the accounting data kept. In practice, therefore, most countries prefer to divide the industrial from the non-industrial in terms of establishments, that is to say, by distinguishing between establishments that are predominantly industrial and those that are predominantly non-industrial, rather than attempt to cover industrial activities wherever they are carried on. An establishment that conducts several activities but is not organized 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 consistent with the general principle of classifying establishments according to their principal activity.

1.27. In conformity with the 2008 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 government and household units and sub-units embedded in other activities outside the scope of this publication such as manufacturing by the general government sector.

1.28. Small-scale mining and quarrying, manufacturing and water supply activities engaged in 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 the 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, and printing and publishing services. It is sometimes difficult to isolate the production activities of these units, since they 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 the production process.

1.31. The actual enumeration of the establishments engaged in the various activities will vary in practice 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 through a complete enumeration 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 the industrial sector in terms of the Central Product Classification (CPC)

1.32. The Central Product Classification, Version 2 (CPC, Ver.2) (United Nations, 2008a) 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. This 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), division 87 (Maintenance, repair and installation (except construction) services, except group 872 (Repair services of other goods)), and divisions 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 CPC, Ver.2 (or the national versions developed by countries that are fully compatible with CPC), should be used for reporting industrial statistics.

Chapter II

Statistical units

A. Overview

2.1. The scope of the universe of economic entities is vast, ranging from the small entities engaged in one activity or very few activities, that are 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, organizational 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 hierarchic structures. Higher-level organizational 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. It may have one structure or several structures designed to carry out different functions or to serve different purposes.

2.3. In these entities, management of the financial affairs of the business is usually conducted at a higher organizational level than 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-related, are usually maintained for the corresponding level of management responsibility.

2.4. From the point of view of 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, and would also result in statistics that, to a certain degree, best served the interests of users by making it possible to relate administrative records to statistical surveys. However, since the legal and operational structures of economic entities as well as their record-keeping practices as developed in most countries are not suitable for statistical purposes, it is desirable to have guidelines for collection, reporting and statistical units for use in data collection and dissemination so that comparable national and international statistics can be produced.

2.5. The benefits of internationally comparable statistics cannot be realized unless standardization is applied to both definitions and classifications of transactors and transactions. If two or more statistical collections cover the same economic activity over time, meaningful comparison between data cannot be made unless the object of comparison applies to the same units. The statistical unit serves as a tool for measuring in an unduplicated and exhaustive manner several aspects of the economy. In general, the utility of standard classifications of activities, institutional sectors and geographical regions is weakened if they are applied to a set of transactors that are not

defined in a standardized way. While the argument is often heard that standardization, as imposed by statisticians results in rigidity of format and interpretation, it is in fact a basic tool of a scientific approach to any inquiry.

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

2.7. Another requirement to be met by units used in statistics concerns that data on their activities should be available or it should be possible to compile them meaningfully. It is obvious that to create statistical units and then discover that they cannot be utilized because no data using them could be obtained serves no purpose. 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 that may be statistically irrelevant.

2.8. Statistics must also reflect the organizational structure of production. Units used in statistics should preferably be perceived by their managers and the outside world as viable and operational, in other words, they should have a relative degree of autonomy. The purpose of delineating different statistical units is to identify the economic actors in the economy, that is to say, the levels in the organization of an enterprise at which the financial decisions are taken on the one hand and those 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 according to many different criteria: legal, accounting or organizational; geographical; and production. The relative degrees of importance of these criteria depend on the purpose from a statistical perspective of compilation and dissemination. A legal or institutional criterion helps define units in the economy that are identifiable and recognizable. In some cases, legally separate units need to be grouped together if they are not sufficiently autonomous in their organization. In order to define an institutional unit, accounting or financial criteria also have to be applied. Accounting criteria require that an institutional unit keep a complete set of accounts of its transactions. Organizational criteria state that enterprises are organizational units that have a certain degree of autonomy.

2.10. A unit can be identified geographically. Observational and analytical units are defined in such a way as to permit data to be compiled for the local, regional and national economies. Geographical criteria are helpful in terms of permitting consolidation and preventing omission and duplication of units.

2.11. Production criteria suggest that entities engaged in similar economic activities should be grouped together, as this helps in analysing 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 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 that provides the basis for statistical aggregates and to which tabulated data refer. These units can be divided into two categories:

- (a) *Observation units*: identifiable legal/organizational or physical entities that are able, actually or potentially, to report data regarding 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 statistics that are more detailed and more homogeneous than it would be possible to compile by using data on observation units. Although analytical units are not themselves able to report data on their activities, there do exist indirect methods of statistical estimation, including imputation of such data. Examples of analytical units are units of homogeneous production and local units of homogeneous 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 survey questionnaires are completed. In fact, it is more of a contact address than a unit. Sometimes the questionnaire is filled in by a central administrative office or an accountancy firm which provides this service to its client. Such information-providing entities constitute 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. The reporting unit may or may not be the establishment. Reporting units will, in most cases, coincide with the units for which statistics are compiled, as in the case of single-establishment enterprises where the enterprise and the establishment are identical. In the case of multi-establishment enterprises, 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 by society, independently of the persons or institutions that own them. The characteristics of a legal entity are the following: 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 organization, incurs liabilities on its own behalf, enters into transactions with other entities, receives and disposes of its income, and maintains a complete set of accounts of its transactions.

D. Types of statistical units

1. Institutional units

2.17. Institutional units are the core units 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. An institutional unit has the following main attributes: (a) it is entitled to own goods or assets in its own right and 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 the institutional unit 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 a 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. The first type of units comprises 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, that may own or control them; these include corporations, non-profit institutions and government units. 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: corporations, for example, 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 units are treated as quasi-corporations when they have complete sets of accounts.

2.20. A household is 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 multiperson households are not treated as separate institutional units. Many assets are owned, or liabilities are 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 with regard 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:

- (a) *Legal entities that 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 their owner(s) and are collectively owned by shareowners which have the authority to appoint directors responsible for their general management;
 - (ii) Other incorporated entities: legal entities incorporated in other forms such as cooperatives, limited liability partnerships and non-

profit institutions, which are all treated as corporations in the 2008 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 whose profits cannot be a 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 that 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. Either such units 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 2008 System of National Accounts, they are included together with corporations.
- (b) *Production units that 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 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 a 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 and an increase in domestic productivity through more effective business management. Integration economies lead to the formation of vertical groups, where an enterprise takes control over another enterprise that is either producing raw material or semi-manufactured products (backward integration) or distributing and selling its final product (forward integration).

2.28. An enterprise group is a set of enterprises controlled by a group head. The group head is a parent legal unit that 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 that is empowered to make choices, particularly concerning the units that 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 that 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 organization 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 too 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 constitutes an organizational unit producing goods or services, and benefiting from a certain degree of autonomy in decision-making, especially with respect to 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), a consolidated financial position and the net worth can be derived. It is also used for institutional sector classification in the 2008 System of National Accounts.

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

- (a) The identification of more detailed and therefore more homogeneous categories of economic activities;
- (b) The preparation of regional statistics.

4. Establishment

2.35. An 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. An establishment can be defined ideally as an economic unit that engages, under single ownership or control, that is, under a single legal entity, in one, or predom-

inantly one, kind of economic activity at a single physical location. Mines, factories and workshops are examples. This ideal concept of an establishment is applicable to 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, their magnitude should be small compared with that of 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 the 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 down into one or more establishments, provided that smaller and more homogeneous production units can be identified for which production data may 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; hence, the enterprise is more suitable for the 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 would 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 programme is to compile data classified both by activity and by geographical region. In circumstances in which precision is not required in respect of either the geographical or the activity dimension, 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. Based on the way the enterprise unit is constructed and defined, it may already have a certain degree of homogeneity with respect to its economic activities; some statistics, however, such as production statistics in general and input output transaction tables in particular, may require a higher degree of homogeneity. It is for this purpose that the kind-of-activity unit was created. It allows statisticians to compile statistics that are as homogeneous as possible with regard to economic activities without restrictions in respect of geographical distribution. In order to create

such homogeneous units, the enterprise must be partitioned into narrower and more homogeneous parts.

2.42. The kind-of-activity unit is an enterprise or part of an enterprise that engages in only one kind of productive activity or in which the principal productive activity accounts for most of the value added. In the case of such a unit, as compared with that of an establishment, there is no restriction imposed on the geographical area in which the activity is carried out.

2.43. The aim in creating kind-of-activity units is to meet, as much as possible, the homogeneity requirement. However, the other two requirements, namely, data availability and organizational structure, should not be disregarded. Splitting enterprises into kind-of-activity units entails a trade-off involving homogeneity of economic activities on the one hand and data availability and organizational structure on the other. In most cases, the three requirements are interrelated: the more homogeneous the unit, the fewer the data available, and the less likely the unit's being perceived as a separate entity in the organization. Although it is difficult to indicate how far splitting should go, it should certainly not reach the point where the entities established cease to be transactors in the economy.

2.44. As a statistical unit, the kind-of-activity unit is useful when compiling production statistics where no geographical breakdown of the activities of enterprises is required. It has the required activity-related homogeneity. Each enterprise must, by definition, consist of one or more kind-of-activity units. When it is 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 units 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 those units that 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 may not produce the entire output of homogeneous groups of specific products because the same products can be produced through 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 organization of the enterprise accounts by which it is covered.

(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), that 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) As the pure location in the narrow sense of the term, that is to say, 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 from each other 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 the specification of a separate location, especially when the sites fall within different most detailed geographical area for which series of data are to be compiled;

- (b) As the combination of all locations belonging to an enterprise within a geographical area. The identification of such a statistical unit allows for the distinction between provinces, States, counties, municipalities, townships and even smaller entities like mesh blocks. Therefore, if activities are engaged in at two or more locations, in, for example, the same municipality, township or similar restricted geographical area, covering all of these locations in one single local unit is acceptable in terms of the concept of a local unit.

2.48. Which of the two interpretations is to be applied depends on the statistics in question. If, for instance, the number of factories or schools in a certain area are being counted, or if production processes are being analysed, the location as an individual site is the appropriate unit; if, on the other hand, employment is the subject of the statistics, all locations of an enterprise within the smallest geographical area could well be regarded as one local unit. However, the definition of location decided upon should be such as to allow all related data that are 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 that 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, solely encompass a group of ancillary units. In this instance, the 2008 SNA, recommends that these ancillary units be treated as establishments. The local kind-of-activity unit corresponds to the establishment.

2.50. The relationship between concepts of activity and location is presented in table II.1 and the relationship between different types of statistical units is illustrated in figure II.1.

(d) Ancillary unit

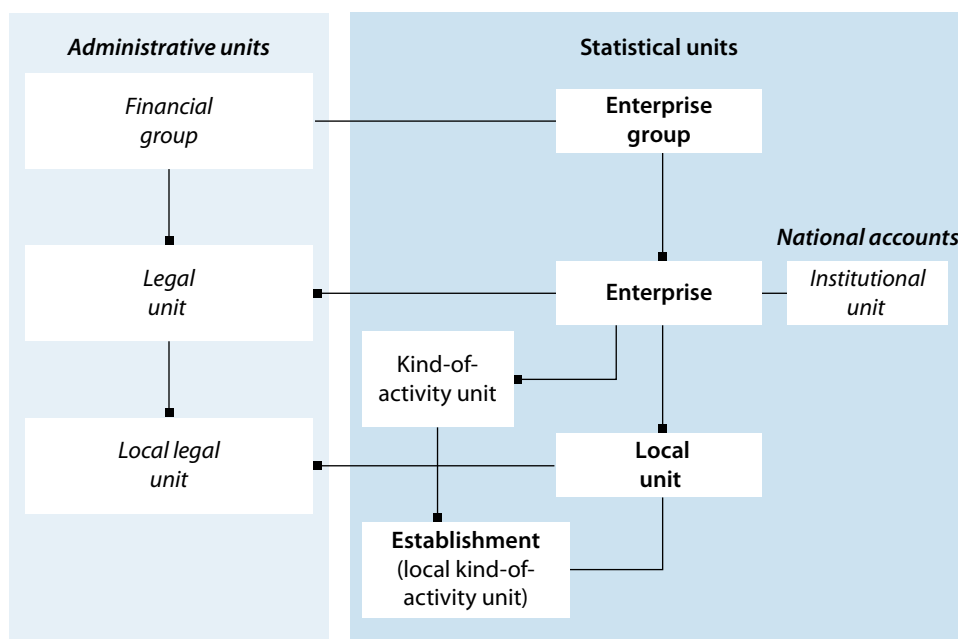
2.51. A productive activity undertaken with the sole purpose of producing one or more common type of services for intermediate consumption within the same enterprise is defined as an ancillary activity. These are supporting activities undertaken within an enterprise in order to create conditions within which the principal or secondary activities can be carried out. Examples of ancillary activities are: record-keeping, communication, purchasing of materials and equipment, personnel manage-

Table II.1

Relationship between concepts of activity and location

	One or more locations	One single location
One or more activities	Enterprise group	Local unit
	Enterprise	
	Institutional unit	
Single activity	Kind-of-activity unit	Local kind-of-activity unit

Figure II.1
Relationships between different types of statistical units



Note: A square signifies that one or more entities can be linked to the entity at the end of the line to which the square is connected.

ment, 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 to depict the economic phenomenon as realistically as possible, which requires that the ancillary activity be treated as an integral part of the establishments or enterprise that it serves because an ancillary activity is undertaken not for its own sake, but in support of the principal or secondary activity that it is associated with. This means that neither the inputs into, nor the outputs from, ancillary activities are recorded separately from those inputs consumed or those outputs produced by the principal or secondary productive activities. Treating the ancillary activity in this way has the following advantage: production processes are recorded in the way that producers perform them, respecting their choices as to whether to perform ancillary activities themselves or to outsource them. Moreover, 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 within the establishments/enterprise they support is that it allows for depicting the actual structure of an economy in respect of specialization or integration of production processes.

2.53. Although this approach does depict the production process as it is performed by the producers, it has the following disadvantages:

- (a) As the ancillary activity is consolidated with the economic activity of the establishment it serves, it is not recognized according to its own activity classification; as a result, its production is not recognized and recorded independently. This treatment does not allow an assessment to be made of the contribution and role of ancillary activities in the economy, and so the structural decomposition of gross domestic product (GDP) by economic activity will not be disclosed correctly;
- (b) Regional GDP cannot be compiled accurately when the unit that is undertaking ancillary activities and the establishments that it serves are located in different regions.

2.54. To overcome the disadvantages mentioned above, it may be desirable and useful to recognize a unit undertaking ancillary activities as a separate establishment—that is to say, as an ancillary establishment—in the following cases, namely:

- (a) When an establishment undertaking ancillary activities is statistically observable, owing to the fact that separate accounts for the production it undertakes are readily available;
- (b) When the ancillary units are in geographical locations different from those of the establishments they serve. The ancillary 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 the cases mentioned above, only when the 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 artificially create separate establishments for these activities in the absence of suitable basic data.

2.56. The output of the ancillary establishment should be derived on a sum-of-costs basis, that is to say, on the basis of all costs of its production including the costs of the capital used in the production. The output will be regarded as market output when the parent enterprise is a market enterprise and as non-market output 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 those establishments (see box [II.1](#)).

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) Multi-territory enterprises

2.58. Some enterprises operate as a seamless entity across several economic territories. Although those enterprises have substantial activity in more than one economic territory they cannot be broken down into a parent and branch(es) because of this seamless operation and their consequent inability to 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 this is not feasible because the operation is so seamless that separate accounts cannot 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 and 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.

Box II.1

Output of the ancillary activity and its allocation to establishments

The example considered in case 1 below involves an enterprise with two establishments and one headquarters (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

$$\begin{aligned} \text{VA} &= \text{output 1} + \text{output 2} - \text{total intermediate consumption (IC)} \\ &= 200 + 100 - (100 + 30 + 30) \\ &= 140. \end{aligned}$$

Case 1.

Enterprise with two establishments and one headquarters (ancillary) unit

Enterprise comprising		
Establishment 1	Establishment 2	Headquarters
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	Output 3 (imputed) = 45

In this case, the activities of the headquarters (ancillary activity) should be treated as being carried out in a separate establishment and classified according to its own activity (ISIC 8211). Its output (estimated on cost basis) should be distributed to establishments 1 and 2 it supports, in proportion to their output. The output of headquarters so distributed to establishments shall be treated as their intermediate consumption.

Case 2 shows the allocation of the headquarters' output to each establishment it supports (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 headquarters (ancillary) unit as an establishment

	Establishment 1	Establishment 2	Headquarters (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
	Output 1 = 200	Output 2 = 100	Output 3 (estimated) = 45

After the allocation, the value added of the enterprise remains the same as before, equal to VA₁ + VA₂ + VA₃ = 70 + 55 + 15 = 140, but the value added for each establishment is reduced by the amount of the intermediate consumption of the headquarters unit allocated to it.

2.61. Sometimes an economic activity takes place in a territory that 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 those raised by the multiterritory enterprise. The same technique of prorating should be used for enterprises operating in zones of joint sovereignty or joint jurisdiction.

E. Statistical units for industrial statistics

2.62. For the inquiries dealt within 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. In order to be analytically useful, the data gathered 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 concept of the ideal establishment cannot always be applied. The establishment may be part of an enterprise that engages in more than one kind of activity at a single location and the organization 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 a distinct establishment, 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 organization 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 which can provide data concerning the production of these goods and services and the materials, labour and physical resources used in that 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 utilized 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 2.63 above, 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 sin-

gle 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 prevent 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 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 above.

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 utilization in industrial inquiries of this unit rather than the establishment. For example, in some cases, data on fixed capital formation, stocks, new orders and sales may be easily available for kind-of-activity units but not for 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 be considered, for many purposes, a suitable alternative to the establishment in those countries where the larger multi-establishment enterprises organize their records on this basis. On the other hand, if the kind-of-activity unit is indeed used in such cases, it would be useful for the relationship between these units and the units used in other inquiries of the system to be indicated.

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 such data relating to their production activities as are available from them, with the remaining data items being requested from the concerned enterprise.

2.70. The determination 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 are best 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 feasible to collect only a limited amount of data. Estimates have therefore 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 the establishment as a statistical unit for industrial statistics so as to ensure the homogeneity of the economic activity and its geographical distribution. However, the choice of statistical unit can be guided also by factors such as the purpose of the study, users' needs, and the availability and quality of the requisite data. Therefore, the enterprise also can be used as the statistical unit. In the majority of cases, the establishment and the enterprise are the same, except in that of multi-establishment enterprises.

F. Statistical units of the informal sector

2.72. Small and unorganized enterprises play an important role in developing countries in terms of the production and generation of employment. These production units, which are part of the household sector, are characterized by high rates of birth and death and considerable mobility and differ essentially from those of the formal sector in terms of technology, economies of scale, use of labour-intensive processes, and the 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, shoeshining and other activities that require little or no capital or skills to activities that involve a certain amount of investment or a certain level of skills such as tailoring and car repair. Many informal sector enterprises are operated by an individual working either alone, as a self-employed entrepreneur, or with the help of unpaid family members, although other informal microentrepreneurs may engage paid workers.

2.73. The informal sector has been defined by the Fifteenth International Conference of Labour Statisticians, in its resolution concerning statistics of employment in the informal sector (International Labour Organization, 1993b) according to the types of production units of which it is composed. It consists of a subset of household unincorporated enterprises with *at least some production for sale or barter* that operate within the production boundary of the SNA. These units typically operate at a low level of organization, 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 on contractual arrangements with formal guarantees. The informal sector thus defined excludes household enterprises producing exclusively for own final use. Countries may use the additional criteria described in paragraph 2.75 below to further restrict the scope of the informal sector. Notwithstanding the different options that exist for defining the scope of the informal sector enterprise, the informal sector always constitutes a subset of household unincorporated enterprises that 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 entities 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, which do not keep a complete set of accounts, thus cannot be treated as quasi-corporations and classified to the corporate sector.

2.75. Apart from including household enterprises with units producing at least some goods and services for sale or barter, the International Conference of Labour Statisticians definition of the informal sector contains additional enterprise-based criteria about the size of employment and the non-registration of the enterprise and/or its employees, whose 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 subsets 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 criteria:
 - (i) Small size of the enterprise in terms of employment;
 - (ii) Non-registration of the enterprise;
 - (iii) Non-registration of its employees.

2.76. A production unit in the informal sector may now be defined as a household enterprise with at least some production for sale or barter that meets one or more of the following criteria: limited size in terms of employment, non-registration of the enterprise and non-registration of its employees.

2.77. Apart from defining the informal sector, the Fifteenth International Conference of Labour Statisticians made the following additional recommendations on the scope of the informal sector and its statistical treatment:

- (a) In principle, all goods and services-producing activities are within its scope and might be aggregated; however:
 - (i) Agricultural activities (ISIC, sect. 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;
 - (ii) Activities of households as employers of domestic personnel (ISIC, division 97), with those 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 that they constitute as self-employed persons or for which they work as employees meet the enterprise-based criteria.

Chapter III

Characteristics of statistical units

3.1. Statistical units are characterized by a number of descriptive variables that are useful for their proper identification. Utilization of these characteristics is helpful in collecting information about units and their structures; providing a sampling basis for statistical surveys; and permitting comparisons and links to be made between data from different data sources, thereby significantly reducing duplication in data collection and response burden. The main characteristics of the statistical unit are identification code, location, kind of activity, type of economic organization, type of legal organization and ownership, size, and demographic characteristics.

3.2. Annual and short-term business statistics on individual establishments and enterprises allow 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: detailed analysis of the performance of regions of an economic territory, of different member States, and of subregions as compared with the world total;
- Activity analysis: analysis pertaining to the structure or business cycle of production of one activity or to the comparison of relative performances of several activities within or between reference periods;
- Legal and ownership analysis: analysis allowing for comparison of performances across the various types of ownership and control, as exhibited, for example, by public, private and foreign-owned enterprises, by economic activities and between economic activities;
- Size class analysis: analysis that shows the relationship among 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. In addition, it allows for the analysis of employment- and performance-related differences between smaller and larger enterprises. This type of analysis is particularly important in 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 geographical 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: (a) allow their registration in a statistical business register or inclusion in a sampling frame; (b) permit the collection of information about them through administrative sources; (c) provide a sampling base for statistical surveys; and (d) permit demographic analysis

of the population of units. The identification code must remain the same throughout the life of the unit, although some of the other characteristics of the unit 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 it has been 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 the place that corresponds to its mailing address. This characteristic serves two important functions: identification of the unit and its classification by geographical region, at the most detailed level, as demanded by the statistical programme; and allocation of the unit's economic activity to the location in which it actually takes place, if the unit operates in more than one location. The latter is important for measuring regional output (regional gross domestic product (GDP) and other economic indicators) and conducting 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) through 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 needed in order to mail the statistical questionnaires and enable written communication with the unit and transmission of ad hoc queries on 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.* In cases where an enterprise has only one establishment, enterprise and establishment 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 for care, however, when dealing with large, complex enterprises. The multi-establishment enterprise may be requested to provide location details about each of its establishments, or the establishment may be requested to provide the name and location of the enterprise that owns it, so that a data set on the enterprise and its own component establishments can be established in the register. In some cases, it may be necessary to correspond with both the establishment and the enterprise because, in general, the unit supplying employment details, for example, will be different from the 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 utilized in determining whether or not a given statistical unit is to be included in the scope of industrial statistics and, if so, to which activity class it is to belong. The kind of activity of the statistical unit should be determined in terms of ISIC, Rev.4.

3.8. Many countries have adapted 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 be realized at the two-digit (division) level of ISIC, Rev.4.

3.9. Each establishment unit should be classified to one kind-of-activity class in the national system of economic classification which should ideally be compatible with ISIC, Rev.4, at least at the two-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 nature of the goods that the unit produces or of the services that it renders to other units or consumers.

3.10. The activity that contributes most to the value added of the unit, or the activity whose value added 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, in accordance with the definition of the latter. The output of the secondary activity is a secondary product. Most units carry out 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 book-keeping, transportation, storage, purchasing, sales promotion, cleaning, repair and maintenance, security, etc. At least some of these activities are conducted by 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 are (a) statistically observable (separate accounts of their production activities are readily available) or (b) located at geographically different locations from the enterprise they serve (see para. 2.54). In such cases, the unit undertaking the ancillary activity is treated as a separate establishment and its activity classification should be determined by its own activity.

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

- (a) The kind of activity of a statistical unit is determined by the nature of its principal activity; secondary and ancillary activities are to be disregarded when classifying a unit (except when the unit undertaking ancillary activities is identified as a separate establishment);
- (b) 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, in this case, the largest share of value added by using the “top-down” method. The top-down method entails, first, the determination of the appropriate highest classification level (one-digit), followed by determination of the lower (two- and three-digit) levels and, finally, of the class (four-digit level). An example illustrating the application of the top-down method is presented in annex II;
- (c) 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 over time to the different activities involved. The following alternative criteria are recommended:

- (i) 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;
- (ii) 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 class of ISIC. These cases may result from horizontal or vertical integration of activities.

Classification of a 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 entailing the carrying out of activities simultaneously using the same factors of production, as represented, for example, by the production of electricity through a waste incineration process. In this case, the activity of waste disposal and the activity of electricity production cannot be separated.

3.17. It will generally not be possible to separate horizontally integrated activities statistically into different processes, assign them to different units or generally provide separate data for them, or to apply rules relying on allocation of value added or similar measures. 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 within 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 a statistical unit engaged in vertically integrated activities

3.18. A vertically integrated enterprise is 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 serves 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, that is, 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 unit involved in multiple activities. This means that a unit with a vertically integrated chain of activities should be classified to the class corresponding to the principal activity within that chain, in other words, 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 (based, for example, 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, because of either seasonal factors or a management decision to vary the pattern of output. This would necessitate a change of classification of the unit. Frequent changes, however, need to be avoided, as they may so distort the statistics as to render their 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 that 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 in 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 organization

3.23. The enterprise and the establishment are the main units used by countries for conducting industrial surveys. The characteristic “type of economic organization” is intended to indicate whether the establishment is the *sole establishment* of the enterprise of immediate ownership or 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 based on 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 for the links between individual establishments and their parent enterprise to be clearly defined. More importantly, these links are fundamental to efficient sampling design inasmuch as one survey might gather information on value added, employment and production statistics usually available at the establishment level, while another may collect data from consolidated financial statements compiled mainly at the enterprise level.

E. Type of legal organization and ownership

3.25. The kind of *legal organization* is another important characteristic and a possible criterion for stratification of economic entities in statistical surveys. The kind of legal organization is the legal form of the economic entity that owns the unit (either the enterprise or the establishment).

3.26. Further breakdowns may also be of interest to users, namely: of incorporated units by *incorporated enterprises* (corporations) except limited liability partnerships and cooperatives, *limited liability partnerships* and *cooperatives*, and *non-profit institutions*; and of unincorporated units by sole proprietors and partnerships not recognized as independent legal entities.

3.27. Incorporated enterprises can be divided into two types: corporations and other incorporated enterprises which may be separated in turn into cooperatives,

limited liability partnerships and non-profit institutions. The grouping based on legal organization could facilitate the choice of the appropriate types of surveys for data collection from the units in each group. Such surveys would be economical and offer the advantage of ease of implementation.

3.28. The producer units may be classified by kind of legal organization as follows:

(a) *Incorporated enterprises:*

- (i) *Corporations.* These are 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 that are collectively owned by shareholders who have the authority to appoint directors responsible for their general management;
- (ii) *Other incorporated entities.* These are legal entities created for the purpose of engaging in market or non-market production of goods and services but incorporated in other forms such as:
 - a. *Cooperatives.* These are enterprises set up by producers for purposes of production and marketing their collective output, in which each owner has an equal share of ownership;
 - b. *Limited liability partnerships.* In these enterprises, partners are both owners and managers and have legally limited liability;
 - c. *Non-profit institutions.* These are legal or social entities that are set up for the purpose of producing goods and services, but whose profits or other financial gains cannot be the source of income for the units that establish, own, control or finance them. In practice, their productive activities are bound to generate either surpluses or deficits but any such surpluses cannot be appropriated by other institutional units;

(b) *Unincorporated enterprises.* These are units set up for producing goods or services that are not incorporated as legal entities separately from their owners. They may include public agencies which are part of general government, unincorporated enterprises owned by non-residents 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:

- (i) *Quasi-corporate enterprises* (as defined in the 2008 SNA). Unincorporated units that are engaged in commercial activities and either keep complete set of accounts of their transactions, including balance sheet, or would be able to compile a complete set of meaningful accounts if so required, are called quasi-corporations. The intention behind the devising of the concept of a quasi-corporation was to separate from their owners those unincorporated units that were engaged in commercial activities, were sufficiently self-contained and independent from their owners, and behaved in the same way as corporations:
 - a. *Government owned.* These are unincorporated enterprises owned by government units that are engaged in market production and whose operation is similar to that of publicly owned corporations;
 - b. *Owned by non-residents.* These consist of permanent branches or offices of foreign corporate or unincorporated enterprises, or

of production units belonging to foreign enterprises that engage in significant amounts of production within the economic territory over long, or indefinite, periods of time. Examples are units engaged in the construction of bridges, dams or other large structures;

- c. *Owned by households.* These are unincorporated enterprises, including partnerships, owned by the households that are operated as if they were privately owned corporations. These should necessarily have a complete set of accounts, including balance sheets, or it should be possible to compile a complete set of meaningful accounts if they were so required. However, experience has shown that distinguishing the quasi-corporations owned by households might in certain cases be difficult;
- (ii) *Household sector* (as defined in the 2008 SNA). This includes partnerships and proprietorships engaged in production of goods and services for the market or own final use that cannot be treated as quasi-corporate entities:
 - a. *Informal sector* (defined as per national considerations). The informal sector is defined as a subset of the household sector, that is to say, as a subset of production units that 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 that would permit the production activities of the enterprises to be clearly distinguished from the other activities of their owners and any flows of income and capital between the enterprises and the owners to be identified;
 - b. *Other household sector enterprises.* These constitute the rest of the household sector enterprises.

3.29. Non-profit institutions usually carry out both market and non-market production. However, coverage in industrial inquiries of those non-profit institutions engaged mainly in non-market production is not required. Only those non-profit institutions that sell most of their output at economically significant prices are within the scope of industrial inquiries. The latter consist mainly of chambers of commerce and industry, industry associations and industry employers' organizations and are usually financed by contributions or subscriptions from member units. Subscriptions are treated as payments for services rendered and not as current transfers.

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

3.31. *Type of ownership.* In addition to taking into account the kind of legal organization, it is considered useful to distinguish between the types of ownership, that is to say, between *private* ownership and the various forms of *public* ownership of units.

3.32. The criterion for distinguishing 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 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 also sell most of its output at economically significant prices. Con-

control is defined as the ability to determine the general policy or programme of an institutional unit. Government is in a position to exercise control over many kinds of units: miscellaneous extrabudgetary agencies, non-profit institutions and corporations (non-financial or financial). It is recommended that national statistical offices consult the 2008 SNA, to acquire a clearer understanding of the delineation process. However, countries may apply simpler and clearer rules such as those of the Eurostat, which determine that control is secured by the government when the government unit owns more than half the voting shares or when a special legislative decree or regulation exists that empowers the government to determine corporate policy or to appoint directors.¹³

¹³ European Commission (1996), para. 2.26.

3.33. By contrast, privately owned units are those owned or controlled by private parties. 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. Control over a unit consists in 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 among 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 differentiated between nationally owned units and those under foreign control could be introduced.

3.35. The following abbreviated version of cross-classification of units by type of ownership and kind of legal organization, is recommended:

1. Incorporated enterprises except cooperatives and limited partnerships and cooperatives
 - a. Public ownership
 - (i) By central government
 - (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. The 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 of monetary units like turnover or amount of net assets. Monetary criteria can be utilized separately or in conjunction with the employment criterion.

3.37. A definition of size based on the average number of persons employed suits 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 countries and do not require additional statistical calculations and adjustments.

3.38. The size of a statistical unit based on employment should be defined primarily 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 the following classes 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 overall 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, organizational or legal factors may exist at the national level. In addition, the wide variety of types 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. Employment in full-time equivalence (FTE) can also be utilized as a criterion for classifying statistical units by size. This measure may provide a more accurate measurement of employment for productivity studies given the increasing tendency to use part-time workers.

3.41. *Full-time equivalent employment* is defined as the total number of hours worked divided by the average annual hours 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 that constitute a full-time job, namely, as a consequence of changes in legislation or collective agreements. The concept of full-time equivalence, therefore does not make the data necessarily comparable since it may vary significantly from country to country. Also, it may not be possible to calculate employment in full-time equivalence in some countries owing to the paucity of detailed data on hours worked.

3.42. Another problem connected with the count of employees arises from the fact that a number of persons exist who are paid by the establishment but whose status is not clear, for example, employees working entirely on commission, employees working mainly on commission with a small retaining fee, and employees 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 and to treat those who receive only or mainly commissions similarly to outworkers in the context of the manufacturing industry; that is to say, the payments received by the latter would be included as part of the cost of contract and commission work rendered by others and their number, if available, should be shown separately, and only as a memorandum item.

3.43. For some types of surveys or analyses, alternative means of measuring the size of the unit, for example, in terms of 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 variables constitutes only a second-best criterion, as it has limited applicability 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. Demographic characteristics provide information about the period of economic activity of a given unit and include the dates of commencement and cessation of its activity. Given the dynamics of creation (birth)/cessation (death) of economic units in the economy, demographic characteristics play a significant role in identifying units as a target population for statistical surveys. Moreover, where the statistics on the demography of units are available on a regular basis, they can provide useful information on the rate of creation of new units, the probability of the survival of units and the differences between ISIC activities in terms of the dynamics of units. 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 should exist and be stored in the business register or area frame. However, owing to the slowness of the administrative process of registration of death or cessation of a unit's activity or its intention to resume its activity after an indefinite period of time, there may be greater difficulty in obtaining information about the date (period) at which the unit actually ceased its activity. Therefore, between the period of operation and the death of the unit, there might exist a period of inactivity, during which the unit is regarded as "dormant". The information on births and deaths of units may also be obtained from administrative sources such as fiscal or juridical authorities, the social security administration or an update of area frames through intercensal enumeration, while statistical surveys will be able to detect the status of the unit, that is to say, whether the unit is active or dormant (inactive) or has ceased its activity.

3.46. There is a growing demand from a wide range of users for the production of internationally comparable statistics on the business demography of statistical units. The key events for these statistics would be 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. Inasmuch as business demography statistics are generally compiled using the enterprise as a statistical unit and the business register as a preferred source of information, it is recognized that the non-availability of an 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*, 2007 ed. (Organization for Economic Cooperation and Development and European Commission, 2007) for further practical and theoretical guidance in this area of statistics.

Chapter 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 definitions of additional data items derived from the basic system. Some of the data items may not exist or they may be of minor importance for certain economies. Compilers are encouraged to use the list of data items as a reference in order to develop a list of data items in accordance with their own statistical circumstances, respondent load and available resources and, after having determined the data items to be placed on that list should use the definitions presented consistently.

A. Understanding the links between business accounting and business statistics

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

- (a) Terms used in the questionnaires must be familiar to business accountants;
- (b) Understanding of business accounting is essential for conversion of the data collected from the records of businesses into economic data that can be used in business statistics and national accounts (for details, see United Nations, 2000).

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, in others they are recorded in three different segments: (a) production, (b) general administration (enterprise overhead, advertising, distribution, etc.) and (c) other incomes and other expenses. Also, it is important to know that most of the time, other operating revenues, which encompass secondary incomes such as rental of buildings, and charges for miscellaneous services which are recorded in business statistics as output and intermediate consumption, are recorded on a net basis (that is to say, income receivable less costs incurred) in business accounting.

1. Differences in terminology

4.4. The meaning of the terminology used in business accounting may vary greatly from one country to another. For example, while in the United Kingdom of Great Britain and Northern Ireland and many other European countries, the word “turnover” means total sales, for the Organization for Economic Cooperation and

Development (OECD, 2007a) “turnover” means the sum of gross sales and 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 of America, the term “turnover” refers to the number of times an asset is replaced during a financial period and is often used in the context of inventory turnover or accounts receivable turnover. In securities, for either a portfolio or an exchange, turnover refers to the number of shares traded for a given period as a percentage of the total shares.

4.5. “Operating expense” is another example of a term whose meaning depends on the country in which it is being applied. In the United Kingdom, operating expenses are limited to costs that vary strictly with the quantity produced—costs, for example, of raw materials and purchased components. In the United States and Canada, however, operating expenses refer to non-manufacturing, non-inventoriable costs 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 remain the same in many countries but accounting rules vary from one country to another. These rules affect the adjustment to the data required so that those data collected from business accounts may be utilized in basic economic statistics. For example:

- (a) Some countries’ rules require accountants to expense expenditures on software (developed in-house or purchased), while others allow capitalization of the same. In countries where capitalization is not allowed, the expenses need to be imputed as output and then should be treated as gross capital formation;
- (b) In business accounting as practised 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.

B. List of data items

1. Demography

(a) Characteristics of statistical units

Item number	Data item
1.1	Identification code
1.2	Location
1.3	Period of operation
1.4	Type of economic organization
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 organization and ownership
1.5.1	Incorporated enterprises except limited liability partnerships and cooperatives
1.5.1.1	Public ownership

Item number	Data item
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	Cooperatives 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 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

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

(b) Number of statistical units

Item number	Data item
1.10*	Number of enterprises
1.10.1*	Multi-establishment enterprises
1.10.1.1*	Number of establishments
1.10.2*	Single-establishment enterprises

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

2. Employment

(a) Number of persons employed

Item number	Data item	Male	Female	Total
2.1*	Total number of persons employed Of which:			
2.1.1	Working proprietors			
2.1.2	Unpaid family workers			
2.1.3	Employees Of which:			
2.1.3.1	Production workers Of which:			
2.1.3.1.1	Employees engaged in research and development			

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

Item number	Data item	Male	Female	Total
2.1.3.1.2	Employees engaged in mineral exploration and evaluation			
2.1.3.1.3	Employees engaged in software and 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 assets 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			

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

(b) Average number of persons employed

Item number	Data item	Male	Female	Total
2.4	Average number of persons employed Of which:			
2.4.1	Employees			
2.4.1.1	Production workers			
2.4.1.2	Other employees			

(c) Hours worked

Item number	Data item	Male	Female	Total
2.5	Hours worked by employees Of which:			
2.5.1	Hours worked by production workers 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 and database development			
2.5.1.4	Employees engaged in production of artistic originals			
2.5.1.5	Employees engaged in own-account fixed assets formation and major repair			
2.5.2	Hours worked by other employees			
2.6	Hours worked by leased employees			

3. Compensation of employees

Compensation of employees

Item number	Data item	Male	Female	Total
3.1	Wages and salaries in cash and in kind of employees Of which:			
3.1.1	Production workers Of which:			
3.1.1.1	Employees engaged in research and development			
3.1.1.2	Employees engaged in mineral exploration and evaluation			

Item number	Data item
3.1.1.3	Employees engaged in software and database development
3.1.1.4	Employees engaged in production of artistic originals
3.1.1.5	Employees engaged in own-account fixed assets formation and major repair
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

(a) Purchases of goods and services

Item number	Data item
4.1	Cost of raw materials and supplies except for gas, fuels and electricity 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 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 and database development
4.1.3.4	For production of artistic originals
4.1.3.5	For own-account fixed assets formation and major repair
4.2	Cost of gas, fuels 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 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 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
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 condition as received
4.6	Rental payments
4.6.1	Rental payments for machinery and equipment
4.6.2	Rental payments for dwellings and structures
4.7	Non-life insurance premiums payable on establishment property

(b) Data items on quantity

Item number	Data item
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 (terajoules)
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 metres)
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**(a) Turnover, sales, shipments, receipts for services and other revenues**

Item number	Data item
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 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 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

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

(b) E-commerce

Item number	Data item
5.4	E-commerce sale/turnover/value of shipments/receipts for services or other revenues

(c) Data items on quantity

Item number	Data item
Q5.1	Quantity and value of individually important products

6. Inventories

Inventories

Item number	Data item
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)

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

7. Taxes and subsidies

Other taxes and subsidies on production

Item number	Data item
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

Output

Item number	Data item
8.1*	Gross output at basic prices
8.2**	Census output at basic prices

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

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

9. Intermediate consumption and census input

Intermediate consumption and census input

Item number	Data item
9.1*	Intermediate consumption at purchasers' prices
9.2**	Census input at purchasers' prices

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

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

10. Value added

Total value added and census value added at basic prices

Item number	Data item
10.1*	Total value added at basic prices
10.2**	Census value added at basic prices

11. Gross fixed capital formation

Assets, capital expenditures, retirements and depreciation

Item number	Data item
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
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

Item number	Data item
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

* 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 in the questionnaire, for example, to verify the accuracy of other information collected.

Note: The capital formation of each component of intellectual property products comprises two components: (a) those that are investment goods acquired from other enterprises and (b) those that are developed on own-account or for own final use. The latter can be approximated only by cost of production of such intellectual property products which is equal to the sum of material and supplies costs, compensation of employees, other taxes on production, cost of capital used in production, and an imputed margin for overhead costs and profits, if possible. The estimate of 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.

12. Orders

Orders

Item number	Data item
12.1	New orders received
12.2	Unfilled orders at the end of the inquiry period

13. Environmental protection

Environmental protection expenditure

Item number	Data item
13.1	Environmental protection expenditures

C. Definitions of data items

1. Demography

(a) Characteristics of statistical units

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

4.8. Most of the items included under this heading are generally set out for the purpose of cross-tabulation of the data. It should be noted that in the case of multi-establishment enterprises, some of those 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, they may be collected at the level of the enterprise, for subsequent allocation to the statistical units supporting it.

4.9. Most of the data items characterizing the statistical units have already been explained in chapter III. Depending on the design and purpose of statistical surveys, those items may be collected at both the enterprise and the establishment levels.

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 providing information about the activity status of the unit (active or temporarily inactive), this characteristic 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, in accordance with the resolution adopted by the fifteenth International Conference of Labour Statisticians (International Labour Organization, 1993b), as a subset of unincorporated enterprises owned by households, that is to say, as a subset of production units that 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 that would permit the production activities of the enterprises to be clearly distinguished from the other activities of their owners and any flows of income and capital between the enterprises and the owners to be clearly identified.

(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. For the purpose of the present recommendations, the pop-

ulation of units is defined as all units that are primarily engaged in industrial activities, that is to say, 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 organizational 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;
- (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. This item 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 are the 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 (that is to say, the 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. Employment¹⁴

(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.

¹⁴ For status in employment, please refer to International Labour Organization (1993a).

Other characteristics might also be of national interest, such as the distinctions between part-time, full-time and seasonal workers, and 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 (for example, sales representatives, delivery personnel, and 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 subcontractors in respect of outworkers is treated as cost on services purchased (item 4.4.1.2))

Working proprietors (item 2.1.1)

4.21. These include all individual proprietors and partners actively engaged in the work of the establishment, excluding silent or inactive partners whose principal activity is conducted outside of the establishment. This category is not applicable to any incorporated or similar enterprise the ownership of which is represented by the 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 to say, without an agreed amount to be paid for work performed). 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 that 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 (item 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 who 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 either on the time spent at work or on 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 ().

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 they are paid by and are under the control of the concerned unit. Employees engaged 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 who are 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 payroll records available for most establishments, that is to say, on the level of detail of those records and the degree of similarity from one unit to another.

4.27. The distinction between production workers 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 affect international comparability unduly.

4.28. It is recognized that there are several categories in which production workers engaged in industrial activities may be classified. For the purpose of the present publication, however, it is recommended that information be collected on the number of and wages and salaries payable to, production workers engaged in the production of intellectual property products (namely, research and development; mineral

exploration and evaluation; software and database development; entertainment, literary and artistic originals) only because this information is useful for estimating (on a cost basis) the value of own-account production of these activities which is recognized as an asset (classified as intellectual property products) in the 2008 SNA.

Production workers (item 2.1.3.1)

4.29. These are 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 it 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 workers.

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) Degree of labour qualification: skilled, semi-skilled, unskilled, apprentice and the like;
- (b) Specific functional category: for example, personnel wholly engaged in own-account construction work, fabrication personnel, processing and assembly personnel, transportation and warehousing personnel, and repair and maintenance personnel;
- (c) Whether employed full-time or part-time.

Other employees (item 2.1.3.2)

4.31. These are defined as all employees other than those regarded as production workers. Where the definition given in paragraph 4.29 above is followed, this category will include administrative, technical and clerical personnel such as salaried managers and directors, clerks, typists, bookkeepers, administrative supervisors, salespersons 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 out in the existing working-time arrangements (International Labour Organization, 1962). Working-time arrangements relate to such arrangements as have been stipulated in laws and regulations, collective agreements, arbitral awards or employment contracts or determined by rules or customs of establishments or communities, 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, fewer or more days per week than the norm, or part-year work.

4.34. It might be useful to provide separate statistics on employees whose working time is equal to normal working hours (full-time employees) or on employ-

ees whose working time deviates from normal working hours (part-time employees). Owing 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 item 2.1.3, Total number of employees, be presented into the following three categories: full-time employees; part-time employees; and employees in full-time equivalents. All three categories should be calculated by reference to the number of hours worked ().

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 comprises 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 per week, etc.). Part-time employees and intermittent/seasonal employees (who may work full-time but for a fixed short period, for example, temporary workers, film crews, etc.) should not be confused.

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

4.37. The total number of hours worked by all part-time employees could be the basis for their conversion into full-time equivalents. The conversion should be carried out with reference 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. The full-time equivalent is defined as the total hours worked in a unit divided by the average (annual, quarterly, monthly or weekly) hours worked by a full-time employee. Such a conversion will facilitate international comparisons with countries that can estimate employment only in terms of full-time equivalents. Owing to the differences in the length of full-time employment by activities, employees' categories, etc., it is recommended that the conversion be calculated at the most detailed level possible.

Outworkers on the payroll (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 the 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 of new technologies and the 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 or her from some process of production for which he or 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 payroll should be enumerated for a single period. Where the numbers are significant and fluctuate, it may also be useful to collect the average numbers 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* (Organization for Economic Cooperation and Development, 2002b). According to the *Manual* (para. 63): “Research and experimental development (R&D) 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 in education and training
- Personnel employed in other scientific and technological activities (for example, information services, testing and standardization, feasibility studies, etc.)
- Personnel employed in other industrial activities (for example, industrial innovations n.e.c.)
- Personnel employed in 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 engaged in exploration for petroleum and natural gas and for non-petroleum deposits that may be exploited commercially and subsequent evaluation of the discoveries made. Mineral exploration and evaluation is recognized as an asset in the 2008 SNA. 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 database 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 2008 SNA. 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 engaged in the production of entertainment, literary and artistic originals. Entertainment, literary and artistic originals are considered an asset and consist of the original films, sound recordings, manuscripts, tapes, models, etc., on or within 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, this item 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 assets formation and major repair (item 2.1.3.1.5)

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

Leased employment (item 2.2)

4.48. Leased employment entails the provision for a fee of human resources for client businesses. Leasing companies operate in a co-employment relationship with client businesses and are specialized in respect of providing a wide range of human resources services. This item comprises the total number of persons supplied by employment agencies or similar organizations to 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 rather than the payroll of the establishment paying the fee. This provision of human resources is typically conducted on a short-term basis (in which case, the unit providing the leased employees will be classified in ISIC, Rev.4, class 7820, Temporary employment agency activities), or on a long-term and permanent basis (in which case, the unit providing the leased employees will be classified in ISIC, Rev.4, class 7830, Other human resources provision). The information on leased employment is useful for meaningful productivity analysis of the industrial production units that actually use the labour inputs of the leased employees. The following are excluded from 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, and accounting services.

4.49. The compensation of employees paid to the leased employees cannot 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 agency in lieu of compensation to leased employees for their services should be collected (item 4.4.1.2.1). The number of hours worked by leased employees is an important indicator for labour analysis.

Number of persons employed in the informal sector (item 2.3)

4.50. The total number of persons employed in the informal sector comprises 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 was 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 in the informal sector (item 2.3.2).

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 excluded from the scope of the informal sector for practical reasons
- Self-employed persons engaged in rendering professional or technical services—doctors, lawyers, accountants, architects, engineers, etc.—if they do not fulfil the requirements for informal sector enterprises
- Paid domestic workers

4.52. Employment in the 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 employment in the informal sector is estimated as the difference between total employment (based on the population census or labour-force survey data) and formal employment (based on economic census, establishment survey or administrative data sources).

(b) Average number of persons employed

Average number of persons employed (item 2.4)

4.53. This data item, which 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, 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 in cases where the circumstances warrant.

(c) Hours worked

Number of hours worked by employees¹⁵ (item 2.5)

4.56. Number of hours worked, also known as *volume of work* or *labour input*, is an 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 hour worked. Number of hours worked by employees is defined as the total number of hours actually spent by them on activities 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, it will provide the average annual hours worked by all persons in an economy, or the volume of hours worked. It is recommended that the indicator 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 that hours worked be imputed from the responses to alternative questions such as the number of workers, average number of working days, length of the productive hours in a 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; may be paid or unpaid, regardless of the place where they are carried out, whether in the establishment, in the home, in the fields or on the street; and may include work taken home from the place of work;
- (b) *Hours spent on ancillary activities*: hours spent on activities that are not directly intended for production but that are necessary to enable such production. These include hours spent on:
 - (i) Design, preparation, cleaning of workplace or work instruments, repairs or maintenance of work processes;
 - (ii) Professional training (for persons in paid employment) authorized and provided directly or indirectly by the employer; and travelling or itinerant activities required or paid for and inherent to the employment such as those of door-to-door vendors, seafarers, drivers and persons travelling to attend a meeting outside their usual place of employment;

¹⁵ See the draft International Conference of Labour Statisticians resolution on working time measurement (http://www.insee.fr/en/nom_def_met/colloques/citygroup/2006_meeting.htm).

- (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:
 - (i) Waiting for customers in an office, shop or street;
 - (ii) Standing by for technical or economic reasons such as lack of work supply, machinery breakdown or accident;
 - (iii) Between productive periods during which no work is performed but for which payment is made under a guaranteed employment contract;
 - (iv) Travel time, as a function of specific work assignments or as determined by specific 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 and may be authorized 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, for example, 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 time spent actually working, even if paid by the employer.

4.60. The number of days worked by employees provides a more precise measure of labour employed than does a count of numbers. As number of days worked is probably easier to obtain from payroll records than are hours worked, it is included as an alternative measurement. 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 number of days worked by part-time workers. Provision is made for subdivision by employment status.

4.61. Some countries calculate days worked as full-time equivalent days by converting part-time and overtime hours into workdays on the basis of the standard number of hours worked per day. Days worked correspond to hours worked, as the results can be calculated in hours, and they should be so calculated 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 should, as resources permit, distinguish between male and female.

3. Compensation of employees

Compensation of employees (item 3)

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, that is to say, measured by the value of the remuneration in cash or in kind that an employee becomes entitled to receive from an employer in respect of the 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, for example, payroll taxes. 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 defined as such in data item 2.1.3.

4.64. No compensation of employees is payable in respect of unpaid work undertaken voluntarily, including work done by 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 salaries¹⁶ 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, or whether payments are made regularly or not. Wages and salaries include the value 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 forms, including that of goods or services provided to employees as remuneration in kind instead of, or in addition to, remuneration in cash.

¹⁶ For more details on the components of wages and salaries of employees, see chapter 7, the distribution of income accounts, of the 2008 SNA.

Wages and salaries in cash

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

- (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, on weekends or during 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 these should also be included in the output and gross value

added of the employing enterprise when such remuneration is 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 to enable them to take up their jobs or to carry out their work. For example:

- (a) Reimbursement of travel, removal or related expenses incurred by employees when they take up a new job or are required by their employer to move their home to a different part of the country or to another country;
- (b) Reimbursement of expenditures of 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 who lose their jobs because of redundancy, incapacity, accidental death, etc., or to their survivors. In practice, it may be difficult to separate payments of wages or salaries made during short periods of absence due to sickness, accidents, etc., from other payments of wages and salaries, in which case the former 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. Some of the most common types of goods and services provided without charge, or at reduced prices, by employers to their employees include the following:

- (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) 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, and car parking;
- (h) Childcare for the children of employees.

4.70. The money value of payments in kind should be expressed as being equal to the net cost to the employer of the goods or services concerned. In cases 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 forgone by employers when they provide loans to employees at reduced or even zero rates of interest for the purpose of buying a house, furniture or other goods or services. Its value may be estimated as the amount that 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. It is the practice of some employers to offer an employee the option to buy stocks (shares) at some future date at a certain price and under some specific conditions. These stock options are a form of income in kind. This offer gives employees the right, but does not impose the obligation, to purchase stock options. Options are usually granted to encourage employees to remain with the company and help it grow. The employee may choose not to exercise the stock option, which is similar to a financial derivative, either because the share price is now lower than his option price or because he no longer works for the employer who offered the option and has thus forfeited it. The following is a description of how stock options are valued, taking into account the probability that not all 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 so-called strike price or exercise price) after a certain time and under certain conditions (for example, the employee's still being in the enterprise's employ, or a specific level of performance of the enterprise). The "grant date" is the date on which the option was provided to the employee, the "vesting date" is the earliest date on which the option can be exercised, and the "exercise date" is the date on which the option is actually exercised (or lapses). In some countries, the permissible length of time between the vesting date and the exercise date is quite long; in others, it is very short.

4.74. The valuation of the options may be carried out through an estimation using a stock options pricing model or as the difference between the market price and the 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 the vesting date. Any change in value between the vesting date and the exercise date is treated not as compensation of employees but rather as a holding gain or loss.

4.75. Elements of labour cost that are not regarded as employee income are not included under 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. Included in this category are:

- (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 that are worn exclusively, or mainly, at work, for example, protective clothing, overalls and 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 utilized 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 may subsequently be 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 data on wages and salaries for employees in these categories, namely (a) research and development (item 3.1.1.1); (b) mineral exploration and evaluation (item 3.1.1.2); (c) software and database 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 that, in infrequent surveys, data be collected on wages and salaries paid to full-time and part-time employees, and to outworkers, by occupation, and that details by gender be obtained.

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, the contribution in question must meet one of three conditions: (a) the beneficiary (or policyholder) must be obliged, or encouraged by law or by the conditions of employment, to participate; (b) the scheme must be operated on behalf of the group and restricted to group members; (c) employers make a contribution on behalf of employees. These insurance schemes may be operated by the employers or by 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, at their own discretion, provide to employees payments for sickness, maternity and employment-related injury, as well as a family allowance, termination pay and other employee benefits, with these payments being treated as part of the compensation of employees.

4. Other expenditures

(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 consumcerned may be (a) resold with or without further transformation; (b) completely used up in the production process; or (c) stocked.

4.83. The data obtained should cover the materials that enter directly into the goods produced, which include all raw materials, prefabricated 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, as well as the purchases of materials used by the unit for own-account fixed assets formation and major repair.

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

4.85. The amount payable for purchase of services during the reference period is also included regardless of whether those services 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 at purchasers' prices, that is, the value when the goods are delivered to the establishment, including the purchase price, transport charges invoiced either by the producer or by other organizations, the cost of insurance, the value of packaging materials charged for, and all taxes and duties on the goods but excluding, where applicable, 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 establishments of the same enterprise depends on whether or not the receiving establishment assumes the economic ownership¹⁷ of those goods—in other words, on whether the receiving establishment uses the goods received to produce a good or to provide a service (goods for processing). For example, an oil refinery that is processing the 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 portion of fixed capital (depreciation (item 11.4)). The goods and services conservice to that unit.

4.88. If the establishment receiving the good has no discretion in respect of 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 that of the processing element only. This is the case for the refinery service mentioned above.

¹⁷ The economic owner of entities such as goods and services, natural resources, financial assets and liabilities is the institutional unit entitled to claim the benefits associated with the use of the entity in question in the course of an economic activity by virtue of accepting the associated risks. (2008 SNA para. 3.26)

4.89. Goods received by the establishment from other establishments of the same enterprise for production of goods 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 in cases where transport of the goods to the recipient establishment is carried out by outside organizations, 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 regarded as having been received at the time such goods are entered in the inventory account of the establishment. Alternatively, goods may be regarded as having been received when the establishment acquires economic ownership of the goods. In general, the times given in this definition coincide 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 prefabricated parts (intermediate products), as enumerated under item 4.1, that 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 prefabricated 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 final 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 devel-

opment (item 4.1.3.1); (b) mineral exploration and evaluation (item 4.1.3.2); (c) software and database development (item 4.1.3.3); and (d) production of entertainment, literary and artistic originals (item 4.1.3.4), and also for fixed assets formation and major repair (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 have been 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 use should be recorded separately in order to measure this portion of the cost of workers' housing borne by employers, which represents, in turn, 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;¹⁸ 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 services via general business surveys, it is important to obtain the name of someone who can be contacted for additional information on the physical use of water and wastewater treatment and discharges. Often, surveys will be filled in by business managers or accountants who will not always have information on the physical quantities involved.

4.100. For surveys of specialized producers (namely, those covered by ISIC divisions 36 and 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, desalination)
- Location of water abstractions and discharges

¹⁸ According to the Food and Agriculture Organization of the United Nations, Sustainable Development Department, "SD dimensions" (April 2000): "Biofuels are fuels of biological and renewable origin, such as fuelwood, charcoal, livestock manure, biogas, biohydrogen, bioalcohol, microbial biomass, agricultural waste and byproducts, energy crops, and others", available from <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 4.3.2)

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 the cost of 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 the 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 maintenance and repair work of an industrial nature, included under group 871 of 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 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 establishments, 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 the 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 for the following are included: (a) communication services (item 4.4.2.2); (b) transport services (item 4.4.2.3); (c) advertising and promotional services (item 4.4.2.4); (d) financial services (excluding interest payments) (item 4.4.2.5); 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; and 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 services 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 relations 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 by the establishment for financial intermediation services and indirect outlays for the purpose of financing the acquisition of fixed assets: for example, flotation costs in respect of security issues such as underwriters' commissions and registration charges, and 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 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 are therefore available in the account books of the enterprise only.

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, according to either 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 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 the enterprises that own them. The allocation to establishments can best be carried out by the data collection and processing unit. The concept of value added then obtained is close but not yet equal to national accounts value-added owing to the fact that the accounting for charges for some non-industrial services such as financial intermediation indirectly measured and insurance service charges can be implemented by national accountants only at the macrolevel. Other differences are the result of a more appropriate valuation in the total economy of changes in inventories and a global balancing of supply and use of goods and services.

*Purchases 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, packaging, breaking bulk and repackaging 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 that 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 support for services (for example, 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 purchasers' prices, including delivery and similar charges involved in the purchase (for example, transport charges, the cost of insurance, the value of packaging, 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 or bartered in payment for the purchase. Transfers from other establishments of the same enterprise should be valued as explained in paragraphs 4.87 and 4.88. When this is not possible in practice, transfers might be valued at cost to the enterprise on delivery to the establishment, that is to say, original purchase price, delivery and similar charges, labour and material directly used and

possibly overhead. Item 4.5 after deduction 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 into the production process; others, in contrast, record the purchases when they have acquired or invoiced them. It is expected that the purchases by the latter group of countries would be adjusted for the changes in inventories of goods for resale. Moreover, the latter group of countries should correct the values for any holding gains or losses generated in the prices of purchased goods in order that they may be estimated 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 equipment (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 (for example, against damages due to fire, natural calamities, losses, etc.).

(b) Data items on quantity

4.123. Data on quantity of goods and services purchased are useful for several purposes and 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 a 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 may be the case for “petroleum products” and “other fuels”—physical quantities of fuel purchased should be reported in terajoules (United Nations, 1982). The collection of fuel data in standard physical units permits the estimation of total energy consumption by the statistical organization 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 (United Nations, 1982). 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. In cases 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 at the 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. Data on the 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 class 3510, Electric power generation, transmission and distribution), 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 metres) 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 metres) of water abstracted from the environment by the establishment during the year, including any water sold or transferred. Saltwater (for example, seawater and saline groundwater) is excluded unless it is desalinated prior to use.

Quantity of water sold (item Q4.3.1.2)

4.135. This item is defined as the total quantity (in cubic metres) 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 calculating the total water used expressed in cubic metres. The calculation of total water used is an important indicator of the pressure exerted by the economy on 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 metres) 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 metres) of wastewater discharged without treatment to the environment by the establishment during the reference period.

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

(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,¹⁹ 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 value added taxes and other similar deductible taxes directly linked to the sales as well as all duties and taxes on products invoiced by the unit which turnover after valuation is equivalent to the valuation at basic prices in the System of National Accounts. 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.

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 (less subsi-

¹⁹ Value of shipments replaces sales when the establishment delivers the good to other establishments of the same enterprise.

dies) on production, depreciation of the fixed assets used in production, and, if possible, an imputed margin for overhead costs and profits. 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, and research and development work of an industrial nature.

4.143. Revenues from activities other than the sale of goods or rendering of industrial services, such as revenues from rental or lease of buildings and machinery and equipment, and 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 economic statistics and business accounting to denote the revenues of producer units. Use of the term “turnover” has been deemed suitable for the purpose of the present recommendations. However, it is recognized that there exist wide variations between countries in respect of 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 summarized in table IV.1 below:

Value of shipments, sales, 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 produced by the establishment, whether in the reference period or in previous periods (that is to say, 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 organizations 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 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 work and machinery should be recorded in the inventory under work-in-progress (item 6.3) 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 listed separately, for expenses relating to transport (whether carried out by the establishment with its own transport facilities or by outside organizations), 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.

Table IV.1
Comparison of the concepts of turnover/sales, revenue and receipts

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 amusement and vending machines operated by others	Yes	No	No	Yes
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
Contributions, gifts, loans and grants	No	No	Yes	Yes
Reduction in prices, rebates, discounts and returned packaging	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: Organization for Economic Cooperation and Development, 2007a.

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.

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 that have 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 barter of goods and services purchased for resale by the establishment. The sale/turnover should exclude value added taxes 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. This item also includes the goods withdrawn by the owners of the establishment for their own use. Those goods should be valued at the appropriate market price (in other words, 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 be sold either to final consumers or 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 5.1.4.4) and to other establishments of the same enterprise (item 5.1.4.5). The invoice prices should exclude value added taxes 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 5.1.4.3)

Contract and commission work (item 5.1.4.1)

4.156. Contract and commission work includes cases in which a production unit (contractor) carries out specific operations of the production activity (like processing, transforming, assembling or fabricating the materials, as ordered by another productive unit (the principal)), constituting the whole or a part of the principal's activity in producing, a good or a service (see also outsourcing (paras. 1.20-1.25)). Sales commissions are not included. A subcategory (item 5.1.4.1.1) 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 are not always ascertainable at the establishment level. The values reported should be the actual amounts receivable, excluding value added taxes 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 include vehicles, machinery, instruments and tools.

4.158. All remaining revenues not included in the above categories should be included in "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 rather 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;
- (h) Any other revenue arising from the production of goods or rendering of services.

4.159. The following items which 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;
- (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 during the reference period for its own use 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 should, in principle, 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 repair (item 3.1.1.5) and cost of materials for own-account capital formation (item 4.1.3).

(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 networks has transformed the traditional way of organizing economic activities. It would be useful to develop indicators reflecting their use in 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 and 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 that have not yet recognized e-commerce separately, it is recommended that they either launch a national survey on e-commerce or 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)).

(c) Data items on quantity

Quantity and value of individually important products (item Q5.1)

4.164. The sales/turnover of an establishment may be broken down by products, for both goods and services, in terms of the Central Product Classification, Version 2.0 (CPC, Ver.2), or other international/national product classifications by product. Figures should be obtained both for the total value of the products and for the quantity of individually important products. This is best accomplished by designing questionnaires tailored to the individual industries that include a preprinted 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 at the end of the inquiry period. It is desirable to include the important industrial products identified by the United Nations Statistics Division and contained on its list (United Nations, 2008b), which forms the basis for data collection on 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 or 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 required principally to measure the value of changes in inventories (item 6.1.3). Changes in inventories consist in the difference (positive or negative) between the value of inventories at the end (item 6.1.2) and their value at the beginning (item 6.1.1) of the reference period. They may also be measured by the value of entries into inventories less the value of withdrawals and 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 the 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 at the 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 value added tax 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 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 to 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 utilized by units in their business accounting practices are:

- (a) FIFO (first-in-first-out): the cost of items sold or consumed during the reference period is calculated as though they were sold or consumed in the order of their acquisition;
- (b) LIFO (last-in-first-out): the cost of items sold or consumed during the reference period is deemed to be that of the most recent acquisitions or production. This implies that withdrawals are valued approximately at current prices;

- (c) Average cost: the cost of an item is determined by applying a weighted average of the costs of all similar items available for sale over a period of time;
- (d) Specific item cost: a method of tracking inventory when the actual cost of each item can be identified separately. This method is 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 that 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 be requested on survey forms.

4.171. Further details of current valuation are discussed by category of inventories directly below.

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 assets work should be included. Whenever possible, it is recommended that the value of inventories of fuels be shown 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 the 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 are received should be treated as shipments and therefore should not be 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 on the revenue side, as in item 5.3. The same value is then entered as that for the acquisition of assets, which is then netted out by the same negative amount in current assets (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 where countries do not capitalize own-account fixed assets in their business accounts, industrial statisticians must ask for this additional information.

4.175. If possible, an imputed valuation in terms of equivalent basic prices should be adopted, including an imputed margin for overhead costs and profits, as well as the cost of materials consumed and the 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, or 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 for resale 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 to their customers in the same condition as received. 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 to say, 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 resale 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. The present 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 utilize 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 the profitability of 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, and levies on the use of fixed assets. Also included are official fees and charges—that is to say, 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 on 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, that resident enterprises may receive as a consequence of engaging in production (for example, subsidies on payroll or workforce, and 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) cannot be directly observed from the accounting records of units. It is calculated from data items in the following groups: Turnover, sales, shipments, receipts for services 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, the difference between the two 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 values of all goods and services that are actually produced within an establishment during the reference period, 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 it has been recommended that the measurement of the census value added be discontinued, it has been defined below 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 gross output except that “Other revenues” (item 5.2) is excluded.

4.189. In order to maintain consistency with the 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, for countries where it may be difficult both for respondents and for survey statisticians to distinguish between “taxes and subsidies on products” and “other taxes on production”, valuation of output at factor cost can serve as the second-best alternative.

4.190. Depending upon the treatment applied to taxes and subsidies on production, countries may adopt either of two valuations, namely, at factor costs or basic prices. Countries are requested to state clearly the method of valuation they have adopted. Consideration of the following relationships is important for a better understanding of different valuation methods.

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
+	Taxes on products (excluding imports and any value added tax or similar deductible taxes, invoiced to the purchaser)
-	Subsidies on products (item 7.2.1)
=	Value of gross output at producers' 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 ()). 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 to say, 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-related 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 cannot 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).

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

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 (item 4.3)
	+	Purchases of services except rental (item 4.4)
	+	Rental payments (item 4.6)
	+	Changes in inventories of materials, fuels and supplies (item 6.2.3)

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 purchased and also delivered by other establishments of the same enterprise").

10. Value added

Total value added and census value added at basic prices (item 10)

Total value added at basic prices (item 10.1)

4.195. Value added cannot 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 <i>at basic prices</i> (item 8.1)
	-	Intermediate consumption <i>at purchasers' price</i> (item 9.1)
Census value added at basic prices	=	Census output <i>at basic prices</i> (item 8.2)
	-	Census input <i>at purchasers' prices</i> (item 9.2)

4.196. Alternative valuation principles, similar to the valuation of gross output (), may also apply. 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 <i>at factor cost</i>
	-	Intermediate consumption <i>at purchasers' prices</i> (item 9.1)
Census value added at factor cost	=	Census output <i>at factor cost</i>
	-	Census input <i>at purchasers' prices</i> (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 industrial statistics and that receipt and purchases

of a non-industrial nature have not been considered. As noted earlier, the present recommendations suggest that the measurement of census value added be discontinued; it is only when countries wish to maintain their time series on census value added that they may opt for continuing its measurement.

11. Assets, capital expenditures, retirements and depreciation

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

Gross value of fixed assets (item 11.1)

4.200. The data item includes the value of all durable goods expected to have a productive life of more than one year and intended for use in the production process by the establishment (land, mineral resources, timber tracts and the like, buildings, machinery, equipment and vehicles). Included are major additions, alterations and improvements to existing fixed assets which 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 resources, copyrights and the like) are excluded.

4.201. As it is expedient to collect data separately for acquisitions (item 11.2) and disposals (item 11.3), 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, for example, 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 value added tax 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 assets 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 causes.

Time of recording

4.206. The general principle governing the time of recording of acquisitions less disposals of fixed assets determines that the time of recording 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 generally not 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 be produced 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 completed or matured 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 the 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 a contract of sale has been concluded in advance, the transfer of legal ownership may be deemed to occur in stages as value is put in place. In such cases, stage payments made by the purchaser can often be used to approximate the value of the gross fixed capital formation although stage payments may sometimes be made in advance or in arrears of the completion of the stage, in which case short-term credits are also extended from the purchaser to the producer, or vice versa. Therefore, the expenditure to be reported as gross value of fixed assets 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. When establishments produce 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

4.211. The transactions in fixed assets are divided into the following categories.

Dwellings (item 11.1.1)

4.212. Dwellings are buildings or designated parts of 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)

4.213. Other buildings and structures comprise non-residential buildings, other structures and land improvements as described below:

- (a) *Non-residential buildings.* Non-residential buildings consist of buildings or parts of buildings not designated as 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, for which the cost of the streets, sewer, etc., are included, as well as the costs of site clearance and preparation. 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 the 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, and are also treated as fixed capital formation. Activities such as land clearance, land contouring, and creation of wells and watering holes that 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.

4.214. The major additions, alterations and improvements of buildings and structures (that is to say, 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)

4.215. 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)

4.216. 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)

4.217. The ICT equipment consists of devices using electronic controls and also the electronic components forming part of these devices. Examples are products within CPC Version 2.0,²⁰ categories 452 and 472. In practice, this narrows the coverage of ICT equipment mostly to computer hardware and telecommunication equipment.

²⁰ United Nations publication, Sales No. E.08.XVII.26.

Other machinery and equipment (item 11.1.3.3)

4.218. 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, and 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)

4.219. Intellectual property products are the result of research, development, investigation or innovation leading to knowledge that the developer can market or use to his or her own benefit in production because use of the knowledge is restricted by means of legal or other protection. Specific forms 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 items 11.1.4, 11.2.4, 11.3.4, 11.4.4, and 11.5.4 as presented in this publication, are for illustrative purposes only: the actual questionnaire should distinguish between what businesses regard as their investment (namely, actual acquisition) and the data that are needed for assessing own-account development of intellectual property products that are not capitalized by industries (namely, imputation). Each component of intellectual property product should be divided into two categories: those that are investment goods procured from other enterprises and those that are developed on own account or for own use. The latter can be approximated only by cost of production which is equal to the sum of material and supplies costs, compensation of employees, other taxes (less subsidies) on production, depreciation of the fixed assets used in production, and a net return to fixed capital.

Research and development (item 11.1.4.1)

4.220. 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.

4.221. The sum-of-costs approach for R&D undertaken on own account by enterprises is illustrated by the following identity:

$$\begin{aligned}
 \text{Output of own-account R\&D} &= \text{material and service costs (intermediate consumption)} \\
 &+ \text{Compensation of employees paid to R\&D personnel} \\
 &+ \text{Other taxes less subsidies on production} \\
 &+ \text{Depreciation of capital goods used in R\&D} \\
 &+ \text{a net return to fixed capital}
 \end{aligned}$$

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

Mineral exploration and evaluation (item 11.1.4.2)

4.223. 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 whether the exploration results in success or not.

Computer software and databases (item 11.1.4.3)

4.224. 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 the 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 the costs of its production if it is not possible to estimate the basic price. The formula used to calculate output is similar to that for R&D (). Note that besides the cost of software purchased as capital goods, the cost of software development for internal own use is also reported here, as an estimate of production cost, and is calculated similarly to R&D. If the respondents cannot provide complete cost data, they should at least report the data on compensation of employees (item 3.1.1.3).

4.225. A database, consists of files of data organized in such a way as to permit resource-effective access to, 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 database management system. The creation of a database will generally have to be estimated by a sum-of-costs approach. The cost of the database management system used should not be included in the costs but should be treated as a computer software asset. However, if the database management system used has been acquired under an operating lease, then the rental payment for this should be included in the cost. Included in the cost of the databases, the cost of preparing data in the appropriate format 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 cost of the database purchased as capital good, the cost of database development for own use is also reported here, as an estimate of costs, and is calculated similarly to R&D (item 11.1.4.1).

Entertainment, literary and artistic originals (item 11.1.4.4)

4.226. 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)

4.227. 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 to its use in production. It is mostly calculated on the basis of historic costs of fixed assets. Depreciation is not consumption of fixed capital, which is the meaning of the term as 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 under data item 11.1.

4.228. 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. This is based on the concept of the expected economic lifetime of the individual assets and is designed to cover the loss in value owing to foreseen obsolescence and the normal amount of accidental damage that is not repairable, as well as to 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

4.229. Other characteristics may be of considerable interest at the national level, the most significant of which is probably the one that hinges on the distinction between new and used fixed assets. The standard adopted for this distinction is given below.

4.230. 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.

4.231. The distinction between new and used fixed assets was included in the 1968 recommendations (United Nations, 1968a) and, for continuity's sake, 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 should therefore be exercised when incorporating this characteristic into the inquiry.

4.232. 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 to say, installations that are used by the staff are of benefit to the staff outside of working hours and that do not constitute any additional production capacity (canteens, sports arenas, restrooms, dwellings for employees and so on). Where this information is desired, it could be fitted into the overall scheme as a subcategory under paragraphs 4.213 and 4.214 above.

4.233. 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.

Treatment of new establishments not yet in operation

4.234. 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

Orders (item 12)

4.235. In selected branches of industry, the following information, at monthly or quarterly intervals, may be very useful in tracking the strength or weakness of investment and production in the economy.

New orders received (item 12.1)

4.236. 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)

4.237. 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)

4.238. 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 owing to the pressures produced by human activities.

4.239. This definition implies that to be included under environmental protection, actions and activities or parts thereof must satisfy the primary-purpose criterion (*causa finalis*), that is to say, that environmental protection is their prime objective. Actions and activities that have a favourable impact on the environment but that serve other goals do not come under environmental protection. Hence, excluded from the field of environmental protection are activities that, while beneficial to the environment, primarily satisfy technical needs or the internal requirements for hygiene or security of an enterprise or other institution.

4.240. 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 aim mainly at environmental protection. An important example is recycling which is included to the extent that it constitutes a substitute for waste management.

4.241. Environmental protection expenditure consists of the total expenditures (current and capital) of an industry whose primary purpose is the protection of the environment, that is to say, the prevention, reduction and elimination of pollution as well as any other degradation of the environment. It comprises uses of envi-

ronmental protection services (such as wastewater treatment), gross capital formation for environmental protection, uses of connected and adapted products and specific transfers that are not already captured in the above categories (such as investment grants, international aid, donations, and taxes earmarked for environmental protection). Connected products are products whose use by resident units directly and exclusively serves an environmental protection objective but which does not encompass 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 of than equivalent normal products (equivalent normal products are products that provide similar utility, except for the impact on the environment); and (b) on the other hand, they are more costly than equivalent normal products. Countries may refer to the SERIEE Environmental Protection Expenditure Accounts: Compilation Guide, 2002 ed. (European Commission and Eurostat, 2002) for more details.

D. Data items for international reporting

4.242. Countries are encouraged to make industrial statistics available on their websites or to disseminate them internationally as soon as they become available to national users.

1. Data items for international reporting with annual periodicity

4.243. Table IV.2 provides a list of data items on industrial statistics recommended for international dissemination with annual periodicity and their level of detail.

4.244. For international comparability, the information on these indicators should be provided annually and cover the entire range of industrial activities in the economy.

2. Data items for international reporting with quarterly periodicity

4.245. Table IV.3 provides a list of data items on industrial statistics recommended for international dissemination with quarterly periodicity and their level of details.

Table IV.2
List of data items on industrial statistics for international dissemination with annual periodicity

Data item	Level of detail	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 and size class	Three-digit level for activity breakdown One-digit level for size class breakdown	18 months
B. Employment				
2.1	Total number of persons employed	Broken down by activity and size class	Three-digit level for activity breakdown One-digit level for size class breakdown	18 months

Data item	Level of detail	Minimum reporting level (in terms of ISIC, Rev.4)	Time lag (after close of refer- ence year)	
2.1.3	Total number of employees	Broken down by activity and size class	Three-digit level for activity breakdown One-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	Three-digit level	18 months
H. Output				
8.1	Gross output (at basic prices)	Broken down by economic activity	Three-digit level	18 months
J. Value added				
10.1	Total value added (at basic prices)	Broken down by economic activity	Three-digit level	18 months
K. Gross fixed capital formation				
11.	Gross fixed capital formation	Broken down by economic activity	One-digit level	18 months
M. Environment				
13.1	Environmental protection expenditures	Broken down by economic activity	Three-digit level	18 months
Q4.2.4	Total energy consumed (terajoules)	Broken down by economic activity	Three-digit level	18 months
Q4.3.1.3	Total water used (cubic metres)	Broken down by economic activity	Three-digit level	18 months

Table IV.3
List of data items on industrial statistics for international dissemination with quarterly periodicity

Data item	Level of detail	Minimum reporting level (in terms of ISIC, Rev.4)	Time lag (after close of reference year)	
B. Employment				
2.1	Total number of persons employed	Broken down by economic activity	Two-digit level	3 months
2.1.3	Total number of employees	Broken down by economic activity	Two-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	Two-digit level	3 months
L. Orders				
12.1	New orders received	Broken down by economic activity	Two-digit level	3 months
12.2	Unfilled orders	Broken down by economic activity	Two-digit level	3 months
Index of industrial production				
Index of industrial production	Broken down by economic activity	Two-digit level	3 months	

PART TWO

Guidance for implementation

Chapter 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 an intense interest in performance measures. Performance indicators make it possible to evaluate performance of producers units and to assess how well the industrial sector is performing in relation to other economic sectors both in the national economy and internationally.

5.2. The information collected utilizing the data items described in chapter IV can be useful in analysing the performance of the producing unit but its direct utilization in policy or management decisions remains rather limited. The present chapter discusses the indicators for monitoring and measuring both the overall performance of the industrial sector as a whole and the performance of its divisions.

5.3. Given the diversity of users' needs and the fact that they may change over time, it is not possible to enumerate a definitive list of performance indicators that can be applied in all countries and in all circumstances. The approach taken in this publication entails, instead, describing the objectives of performance indicators relating to industrial activities, and the key principles governing how they can be developed, best used and interpreted, and providing a list of the most commonly used practical performance indicators. These indicators, as defined, are applicable to a broad range of units/activities.

B. Objectives of performance indicators

5.4. In principle, a performance indicator is a policy-relevant statistic that provides an indication of the conditions in and the 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 for presenting complex information in a synthesized way. They serve as a simplified means of summarizing the information and communicating it to decision makers, policy analysts, researchers and the public.

5.6. As a tool for measuring the overall performance of the industrial sector of the economy, the performance indicators help policymakers and economic planners monitor and evaluate how effectively the industrial activity is organized, identify potential areas of improvement and make more informed strategic decisions regarding future strategy for development.

5.7. Performance indicators also help the business community. By using them, 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 objectives 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 resources, increased production, and improved reputation among customers.

5.8. Every performance indicator relates, implicitly or explicitly, 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 and industries and over time, and for identifying factors that lead to better performance.

C. Types of performance indicators

5.9. Performance indicators can be broadly divided into three types, namely: (a) growth rates, (b) ratio indicators and (c) share indicators. These indicators may be regarded as part of the industrial statistics programme and calculated at the three-digit (group) level of ISIC, Rev.4, for annual periodicity and at the two-digit (division) level of ISIC, Rev.4, for quarterly periodicity.

5.10. Most performance indicators have a comparative dimension or a reference point which permits time-series evaluation. Depending on the importance and availability of data, 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. 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 would not be desirable to sacrifice this goal for the sake of achieving a very detailed compilation and analysis of performance indicators that are of minor importance but that require much additional data. The purpose of utilizing 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 that are useful for measuring the overall performance of the industrial sector of the economy. Several indicators could be compiled by using information collected on the data items described in chapter IV; some of the common indicators that countries are encouraged to compile are presented directly below.

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) constitutes the value added growth rate. It is expressed 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) Growth of employment in the industrial sector

5.14. Employment growth in industrial activities is the annual (monthly or quarterly) percentage change of persons employed (data item 2.1) in the 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 in respect of how productively labour is used to generate output. This indicator is useful for tracing 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 labour requirements by industry.

5.16. This indicator is easy to measure but it does have 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. A 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 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. The output per hour worked is obtained by dividing the total output (item 8.1) by the total hours worked (item 2.5) to produce this output.

(c) Value added per person employed

5.18. This indicator is the ratio of the total value added (item 10.1) to the total number of persons employed (item 2.1). Determining the value added per person employed is the popular method for estimating the trends in labour productivity for the 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 5 (a)). This indicator is useful for monitoring 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:

- (a) *New orders received.* This item is defined as the current value of all new orders received during the reference period;
- (b) *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” during 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-shipment ratio is the relationship of the values of inventory (item 6) to the total shipment (item 5 (a)) 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, which measures the intensity of energy use in terms of quantity of energy consumed (measured in terajoules) per unit of value added, can be derived as the ratio of total energy consumed (item Q4.2.4) to total value added (item 10.1). Declining trends of the indicator indicate that an industry is improving its energy efficiency and hence decoupling economic growth from energy consumption. Improving energy efficiency has beneficial effects on energy security and reduces pressures on the environment from economic activities.

(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 metres (item Q4.3.1.3)) to total value added (item 10.1). As an indicator of the pressure of the economy on water resources, it shows over time whether a country is managing 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 United States dollars) by economic activity. Total water used by an economic activity consists of the sum of (a) the quantity of water abstracted from the environment either permanently or temporarily for own use (item Q4.3.1.1) and (b) the quantity of water purchased (item Q4.3.1) minus (c) the quantity of water sold (item Q4.3.1.2).

(h) Ratio of environmental protection expenditure to value added

5.23. As the name indicates, this indicator is computed as the ratio of environmental protection expenditures (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 to protect the environment.

3. Share indicators

(a) Share of industrial activity value added in total value added

5.24. This indicator refers to the value added generated on account of industrial activity (or any other economic activity) as a proportion of 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 the contribution of individual economic activities to gross domestic product (GDP).

(b) Employment in industrial activity as a share of total employment

5.25. This indicator serves as a useful tool for assessing the segmentation of and the trends in the labour market. It is calculated as the ratio of 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.

Chapter 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) securing 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 the 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, in order 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 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 negligible non-response;
- (b) Avoidance of response burden: the responding units make available the information as part of the administrative procedure;
- (c) It is cheaper for the statistical office to acquire data from an administrative source than to conduct a survey although, in some cases, processing of those data may be costlier;
- (d) No sampling errors;
- (e) Data reported may be more accurate because of intensive 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 with administrative objectives. This limits the use of administrative data for purposes of statistical estimation and analysis;

- (b) Poor integration with other data of the statistical systems: this is a problem in particular when administrative units do not correspond to statistical units either because of differences in concepts or because of deviating identification numbers. Even if the variables existing in the administrative register fit perfectly the needs of the statistical office, a matching problem can prevent their use;
- (c) Risks with respect to stability: administrative processes are subject to change in response to new legislation without there being 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 only after unacceptable delays;
- (f) Legal constraints with respect to access and confidentiality.

6.4. The administrative source as an alternative source for data collection should not be ignored, as it can be of great help in reducing significantly the response burden and the surveying costs. The relative advantages and disadvantages mentioned above have no absolute value. Whether they apply and to what extent depends on the specific situation. Therefore, the review should be perceived as providing a checklist that 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 achieve a harmonization in concepts and classification system among different types of statistics. To achieve this, it is important that statisticians in different branches of the government coordinate their work in setting national statistical standards. In many countries, this has been achieved quite successfully. For example, business financial statements in France have been prepared since 1947 with the participation of the French national statistical office and the Ministry of Finance so as 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 of 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 of production and financial statistics for national private enterprises, foreign controlled enterprises and household enterprises.

Privately controlled administrative data sources

6.7. Besides using administrative data sources set up in response to legislation and/or regulations, statistical offices may obtain certain data from private-sector data suppliers.²¹ Private-sector data suppliers operate on a commercial basis; therefore, the transfer of data from them to the statistical offices involves a contract and the payment of a fee. The data collected by private-sector data suppliers can serve as an important supplement to the official statistics. Such data should, however, be carefully examined for its scope and coverage and considered for use only when they are found to be of acceptable quality.

²¹ An example of a private sector data supplier is Dun and Bradstreet in the United Kingdom of Great Britain and Northern Ireland.

2. Statistical surveys

6.8. Administrative data alone are 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 responses from only a few representative units scientifically selected from the population (sample survey).

6.9. Both census and sample survey techniques are used for collecting industrial statistics. The census approach, which covers the entire population of statistical units for a particular type of subject matter, is obviously a time-consuming and resource-intensive exercise and is generally used to generate industrial statistics with lower frequency, that is to say, those required at longer intervals of time. The sample survey technique, on the other hand, is a less costly means of collecting data for the purpose of generating industrial statistics with the required degree of precision for high frequency over 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 being 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 respect of concept and coverage of the statistical units and the target population are overcome in adopting the sample survey as the means of data collection because the planning and execution of the sample survey, the data collection and the processing procedures are under the control of the statistical office.

6.11. The disadvantages of the survey approach stem from the fact that it is resource-intensive (both financially and in terms of manpower), with an additional respondent burden, 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 inquiry 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 inquiry 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 are enterprises (or statistical units belonging to those enterprises) in their capacity as the reporting units from which data are obtained, and as 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 for covering only unincorporated (or household) enterprises which are numerous and cannot be easily registered.

6.14. Availability of a sampling frame for the statistical units is a prerequisite for conducting the survey, as the frame provides a basis for the 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 the completion of 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 the data are collected.

6.15. Countries will have flexibility in choosing the data sources most appropriate for them, based upon the practices supported by their statistical system 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 directly below.

(a) *Enterprise surveys*

6.17. The conduct of enterprise surveys presupposes 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, it is recommended that the list of enterprises to be used as the sampling frame be drawn from the latest economic census conducted. In an area-based enterprise survey, a sample of areas is selected first, and then selected areas are enumerated for the purpose of compiling the list of enterprises operating in the area that serves as the sampling frame for the selection of the enterprises in the sample and the collection of the requisite information. List-based enterprise surveys are generally to be 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 than that for the list-based survey is required to achieve a given level of precision;
- (b) It may be difficult to enumerate the enterprises within an area. While many enterprises are likely to be readily identifiable, household-based enterprises which 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, it is usually considered preferable, in order to avoid inadvertently missing parts of the enterprise, to collect data from the whole of an enterprise, not just a part of it.

6.18. The area-based enterprise survey approach is used for collection of data from small enterprises and microenterprises generally operating in informal or unorganized segments of the economy. For such enterprises, a satisfactory list is normally not available.

(b) *Mixed household-enterprise surveys*

6.19. In 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*, that is to say, the sole proprietor of, or a partner in, an unincorporated enterprise. Data for all the enterprises thereby identified (or for a subsample 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 the fact 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 own-account workers and employers by broad industry groups in the stratification of the enterprises to be selected for the data collection.

6.21. Mixed household-enterprise surveys can provide coverage of small enterprises and microenterprises that are not included in list-based enterprise surveys. However, they suffer from disadvantages similar to those area-based enterprise surveys, that is to say:

- (a) A household listing approach often falls short of ensuring complete coverage of activities conducted in identifiable establishments outside the home of the business owner;
- (b) Handling enterprises with production units at more than one location presents a difficulty. 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. In such cases, the fieldworkers have to rely on proxy reporting to ensure that the survey questionnaires are filled out.

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 the multi-establishment relationship. The need to undertake the process of producing a list frame and a complementary enterprise-establishment area frame explains why area-based enterprise inquiries are generally more expensive than mixed household-enterprise surveys.

6.23. To avoid the limitations connected with the mixed household-enterprise survey approach, some countries (for example, India since the late 1970s and the Philippines) have adopted the *modified mixed household-enterprise surveys approach*, which involves a dual, mutually exclusive, listing of (a) households and household-based business operators and (b) 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 within the domain of the survey.

6.24. The modified mixed household-enterprise surveys approach is to be preferred to an area-based enterprise survey, as it improves the quality of the data of micro- and small units, especially mobile units as compared with those with a 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 even the 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 data-processing operations in establishment/enterprise surveys. Editing is the system-

atic 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 the quality of the collected data. Microediting (also called input editing) focuses on the individual record or questionnaire, as opposed to macroediting, where checks are performed on aggregated data.

6.26. Poorly phrased questions in a questionnaire are one of the main sources of respondent errors. It is therefore, better to direct one's efforts towards eliminating poorly phrased questions from a questionnaire rather than towards trying to correct through editing incorrect responses generated by poor questions. After a questionnaire is developed, it should be tested before being used in industrial surveys for data collection.

6.27. Selective (significance) editing is an approach for prioritizing and further reducing the costs of editing, which is one of the most resource-consuming processes in the production of official statistics. It is a procedure that targets only those microdata items or records that would have a significant impact on the results of industrial surveys.

6.28. The data editing may take place during the data entry (input editing) or after (output editing). The following edit checks may be useful in detecting errors in the data:

- (a) *Routine checks*: used to test whether all questions that should have been answered have in fact been answered;
- (b) *Valid value range checks*: 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 sizes of the statistical units;
- (c) *Rational checks*: a set of checks based on the statistical analysis of respondent data. Many checks take the form of a ratio between two variables, which should be within specified limits. Another type of rational check is the arithmetic check, specifying, for instance, that a sum of variables should equal a stipulated 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 not even the most exhaustive data editing will ever result in an error-free data file. For example, sustained systematic errors, such as under-reporting of production and over-reporting of costs by producer units, can hardly be detected.

6.30. Responses for some particular data items have the most significant impact upon the main estimates. These are often termed *influential observations*. Editing efforts should generally be focused to a greater extent on such data-item responses. In particular, very large enterprises are usually a source of influential observations and their data should be checked individually.

6.31. Sometimes, information on some variables of interest may be also available from other sources, which should be used for validation of data obtained from industrial surveys. Comparison of data from different surveys may be helpful in revealing discrepancies or inconsistencies among them. The prerequisite for the conduct of such an exercise is that all the surveys should have been carried out within a conceptually consistent framework for all business statistics, using standardized variables and classifications.

2. Imputations

6.32. Missing data are often encountered in most of the surveys, which creates problems for the data editing. Either the data may be missing for a particular data item of the questionnaire (item non-response) or the selected unit may not have returned the filled-in questionnaire at all (unit non-response). The technique of imputation is used for estimating the missing data in the 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 did not answer all relevant questions, but responded to only part of them. Cases may arise where a respondent has reported on all questions but either some of the answers may be illogical or there may be inconsistencies between some of the answers provided by the respondent. Presence of such item non-response or of invalid data in the data set ultimately affects the quality of the survey results. Many of these problems are eliminated when the appropriate editing rules are followed. However, the detection of such cases of response errors during the editing process may entail the deletion of one or more items, 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 for dealing with missing data items (non-response):

- (a) All forms with missing values are ignored and analysis is confined to the fully completed forms;
- (b) Missing data are estimated so that the data matrix will be complete. This is called imputation. Statistical analysis techniques are applied to 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 item non-response. The values of individual data items that are missing from the original response or that are believed to be in error should not be automatically interpreted as zeros. When all of the data have been edited using the predetermined rules and the file is found to have missing data, imputation is usually carried out as a separate step. It resolves inconsistencies that remained 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 that process through which gaps are filled and inconsistencies eliminated and it is the means by which a complete and consistent file containing imputed data is produced. There are a variety of imputation methods, ranging from simple and intuitive statistical procedures to rather complicated ones. Some of the commonly used methods are:

- (a) *Subjective treatment*: imputation on the basis of values that appear reasonable. For example, one might deduce the labour costs if the number of employees are known;
- (b) *Mean/modal value imputation*: imputation of the mean value of a variable for missing data. For categorical data, the modal value is imputed. One improvement may entail imputing the median in order to eliminate the effect of outliers;
- (c) *Post-stratification*: more precision may be achieved in respect of keeping the imputed value closer to the true value if the mean, mode or median is imputed using the observations from those units that are homogeneous with the one with missing data. For this purpose, post stratification is used

that is to say, the sample is divided into strata and the stratum mean, mode or median is then imputed;

- (d) *Substitution*: this relies on the availability of comparable data. Imputed data can be the values for the enterprise from the same survey occasion in the previous year, as adjusted to reflect the average increase (decrease) of the value of the data item in the stratum;
- (e) *Cold deck*: this 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 fulfil complete or partial imputation requirements;
- (f) *Hot deck*: this encompasses a family of imputation methods widely used in survey practice. A hot-deck method is generally one where each missing value is replaced by the value available from a “donor”, that is to say, 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, on yearly income) replaces the corresponding missing or invalid response;
- (g) *Nearest-neighbour imputation or distance function matching*: this is another method through which a donor can also be found. An item value is assigned 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 unit with the value closest to the missing value is then used as the donor;
- (h) *Sequential hot-deck imputation*: 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 missing or inconsistent item values.

6.37. There are other, more advanced techniques of imputation like the Fellegi-Holt edit and imputation method (Fellegi and Holt 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 of these methods produce a single imputed value for each missing or inconsistent value; but they tend 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 as regards 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 single method is superior to the others in all circumstances. In most imputation systems, a mix of imputation methods is used. The following are the desirable properties of all imputation programmes:

- (a) The imputed records should closely resemble the failed edit record, while retaining as much respondent data as possible. Thus, a minimum number of variables (or fields) should be imputed;
- (b) The imputed records should satisfy all edit checks;
- (c) The imputed values should be flagged and the methods and sources of imputation identified.

6.40. As regards unit non-response, it is possible to minimize it by promoting awareness of the importance of the data to be collected; by appealing to the respondents, through print and electronic media at the launch of the survey, to cooperate with the statistical authorities; by issuing reminders to the non-respondents; and by 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 a response to the survey conducted by the national statistical offices and are liable to be penalized in case of non-response. However, this does not eliminate the problem of unit non-response. Unit non-response may occur for any number of reasons—non-existence of the unit included in the survey, lack of appreciation of the importance of the data on the 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 so as 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, among other functions, to expand the sample information to the level of the target population. Alternatively, the problem of unit non-response can be dealt with by using 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 administrative information available for it.

3. Grossing up procedures; aggregation

6.43. After the data have been validated and edited and imputations have been corrected for the non-response, the data are used to estimate the level of the variable. Grossing up consists in raising the sample value by a factor based on the sampling fraction (or a factor using returned data) for each cell in the stratified sample in order to obtain the levels of data for the frame population. The grossing up should use edited data to calculate a value representative of all units. In the case where information on the auxiliary variable related to the variable under study is available for units in the sample as well as in the sampling frame, more sophisticated statistical techniques can be applied to this information for the purpose of grossing up.

6.44. Outlier values should be identified and handled carefully, as they may affect the estimates significantly. Outliers constitute a particular category of influential observations that are correct but 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 the outlier value is included in the sample, the final estimate will be substantially larger than needed and highly unrepresentative, as it has been driven by one extreme value. The simplest way to deal with the outlier is to reduce its weight in the sample so as to ensure that it represents only itself. Alternatively, statistical techniques can be used to calculate a more appropriate weight for the outlier unit.

Chapter 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 within the economy. This information may be obtained either through the statistical surveys or through institutional links with the data sets available elsewhere, in administrative sources. Generally, a mix of the two sources is used for the collection of industrial statistics. The extent of the use of one source rather than the other depends upon the statistical system of a particular country. Countries with a developed statistical system make progressively more use of administrative sources for coverage of industrial activities.

7.2. A sample survey normally constitutes an efficient method for obtaining statistical information from large populations without confronting 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 the sampling frame, be it a statistical business register or an 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 the production of goods and/or services. The enterprises in the statistical business register have identifiable links to their establishments and are classified by economic activity. The business register as a statistical frame is described in section A below.

7.4. In countries with less advanced statistical systems, the statistical business register will be 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 designed to complement the statistical business register.

A. The business register as a statistical frame for industrial inquiries

7.5. The list of all economic units in the survey target population is known as the 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 and size codes, name, address and description of the unit, telephone number, 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. It may not always be possible in practice, often for cost reasons, to cover all micro- and small units; therefore, some sort of cut-off is usually applied in practice. The proportion of the GDP covered by the units in the frame is often a more useful cut-off measure than the proportion of units covered. With respect to the present recommendation to cover the industrial sector

of the economy as a whole, the statistical register should be complemented by an area frame designed to cover the enterprises not included in the register (see sect. B).

1. Purpose of the business register

7.7. The business register is an important statistical tool which provides not only the sampling frame needed for conducting the sample survey for the collection of data but also the basis for grossing up results from sample surveys so as to produce business population estimates. A business register of good quality helps improve the efficiency of the national statistical system, which in turn helps reduce the response burden imposed on businesses. A business register can open up possibilities for electronic data interchange for statistical work, including transfer of data on a regular basis between national statistical offices, and business and other national organizations.

7.8. It is desirable, as the best option, that the frame for every list-based enterprise survey undertaken as an inquiry on industrial activity be derived from a single general-purpose activity business register maintained by the statistical office, rather than that stand-alone registers be used for each individual survey. There are two basic reasons for using a single business register. First, and most importantly, the business register operationalizes 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 that they provide. Second, it is more efficient for a single organizational 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 the case of an 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, such information may not be available 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, might be requested to provide the name and address of the central office of that legal entity. For practical purposes, it is also useful to request a list, from the central offices, of subsidiary legal entities and establishments.

2. Creation and maintenance of the business register

7.10. Given the size and scope of statistical business registers, it is unlikely that they can be satisfactorily compiled and maintained solely through surveys and the stand-alone efforts of the national statistical office. Different sources may be utilized in setting up a statistical business register. Before it is used, each source must be carefully examined and care must be taken to overcome its 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; in this case, such a decision should be made with a full awareness of its implications and some attempt should be made to describe and measure the resulting deficiencies.

7.11. If the coverage of the business register is to be as representative as possible, it should contain current information on its constituents. This means the regis-

ter should be carefully maintained over time to take note of the changes in enterprise dynamics. For example, ongoing enterprises may merge, split up or go out of business, change production activities, or move their location, while new enterprises may be created (*births*) and existing enterprises may cease to exist (*deaths*). Unless the business register is maintained on a regular basis, it will quickly lose its value by becoming dated and ceasing to adequately reflect activity in the real world. Described below are some of the sources utilized 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, its conduct is generally a resource-intensive exercise and requires large inputs of manpower and time. Censuses therefore tend to be carried out infrequently, for example, once every five years. However, especially when a country is initiating an economic statistics programme, the census is undoubtedly the most useful instrument available. Trained field enumerators can seek out each physically recognizable place of business and collect the necessary information by direct interview and observation. In addition to its high cost, this approach has the disadvantage of not being able to document non-recognizable places of business or enterprises without a fixed location.

(b) Administrative data sources

7.13. The sources of administrative data available for creating and maintaining a business register population will vary from country to 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, as 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 was designed. Typically, it does not provide a list of enterprises broken down into establishments (or other statistical units), according to the statistical office model of statistical units, and classified by activity.

7.14. The same administrative sources that were used to create the business register, for example, business registration systems, VAT tax systems, payroll tax systems, etc., may also be used to maintain the register. The data may be used to update the business register based on the same cycle as that of the administrative source. For example, business tax data processes will often have a quarterly cycle; therefore, tax information can be used to update the business register quarterly after the tax cycle has been completed. Business registration/licence systems, which often have an annual cycle, may be used to update the register along the same lines.

7.15. Although there are many good reasons for using administrative sources, there are also a number of problems associated with them, depending on the administrative source used, for example, the administrative register may contain inactive units. Thus, it is vital to make use of any information from administrative sources that can indicate whether an enterprise is active or not. For example, if the administrative source contains information concerning 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 tool for creating and updating the business register, as it provides new information on changes in contact address, closure of the 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 a primary source in creating the business register.

(f) Other potential sources

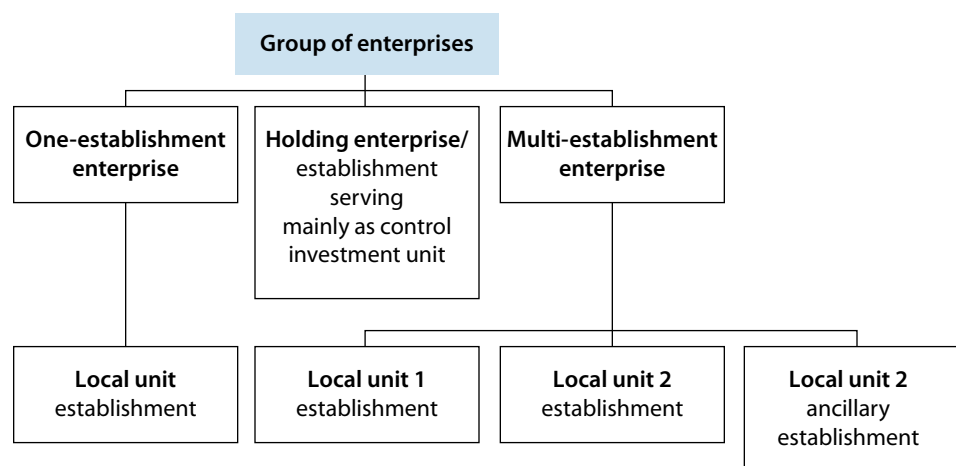
7.19. These include telephone directories or special listings prepared by telephone companies. Each type of source has its own special characteristics which must be studied carefully before a decision is made on how to use it.

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 that 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 that are going out of business. The register of establishments serves as the mainframe for collecting data on production. Thus, proper codes should be assigned to the enterprises and establishments so as to establish hierarchic links 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; and the 2008 SNA treats holding companies as “other financial institutions”. A typical hierarchic relationship to be identified in the business register is illustrated in figure VII.1.

7.21. As a minimum, the business register should include the following information:

- (a) Name and physical location of each enterprise;
- (b) Mailing address, which may be different from its physical location;
- (c) Name and address of the central office or the headquarters of the enterprise and establishments that are part of a multi-establishment enterprise;
- (d) Kind of economic activity: description or code;
- (e) Legal organization: incorporated or unincorporated;

Figure VII.1
A typical hierarchic relationship to be identified in the business register



- (f) Type of ownership: public (by central, state and local governments); national private and foreign controlled;
- (g) Number of persons employed;
- (h) Volume of sales or value of output;
- (i) Source and date of information.

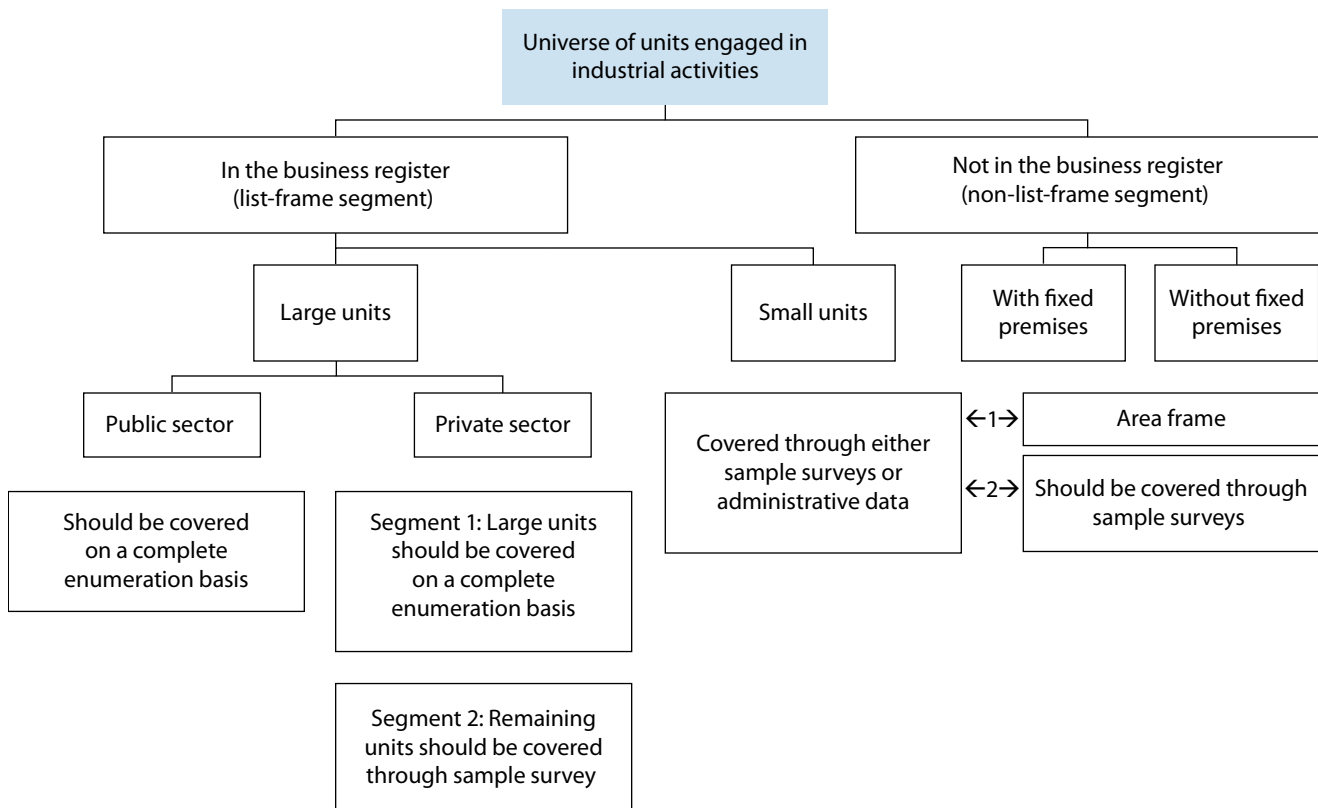
7.22. Because of the typically large number of small establishments, especially in the developing countries, the establishing and maintaining of a complete directory would be very difficult and expensive. As a result, countries may establish a specific size cut-off and include in the business register only those establishments over a specific size that might differ by economic activity depending on the share in value added. A business register may serve as a useful instrument in conducting the sample inquiries only if full coverage of the universe can be assured and the register is accurately maintained. The difficulty of accurately maintaining statistical business registers is faced even by 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 the purpose of collecting and reporting industrial statistics. This embraces units of all sizes and types including government and household units. Household units include micro- and small-scale manufacturing activities that are household-based and operate outside the household at a separate location or at no fixed location (for example, mobile units). “Unincorporated household unit” is a term whose utilization is more appropriate in developing countries. In many developed countries, a household unit generally assumes the more formal form of a small enterprise and is incorporated. Some micro- and small household units, however, may still remain unincorporated. The general data-collection strategy for different segments of the economy is presented in figure VII.2.

7.24. In order to achieve complete coverage of industrial activity, the 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. Within the scope of industrial statistics, there are significant differences between units in respect of legal organization (incorporated or unincorporated), size (ranging from

Figure VII.2
Data-collection strategy for different segments of the economy



Note: 1. All units on the business register are excluded from the area frame (that is to say, the 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 the non-list-frame segment.

large to small and microenterprises) and type of ownership (public sector, privately owned or foreign controlled). At one end of the spectrum lie corporate units which are incorporated under the statute of a country and are comparatively large; at the other end are unincorporated enterprises characterized by low level of organization. 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 within the scope of industrial statistics.

7.25. The production units that are incorporated under the statute of a country are highly organized and are required to keep account of their transactions. These are corporate units, popularly known as companies, which are required to present their annual accounts to the authorities with which 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 other containing the rest. It might be determined that the large-scale segment of the economy is not suited for sample surveys because the differentiation in terms of size and activity is great compared with the number of units involved. Enterprises in the large-scale segment should therefore be covered on a complete enumeration basis, if possible. The smaller enterprises, whose number tends to be

much larger, are relatively homogeneous as compared with their large-scale segment counterparts. A sample survey can be more appropriately used to cover this segment of enterprises.

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 methods are necessary, as the register of unincorporated enterprises is not available (see sect. C below).

C. Survey method

7.28. The present section describes the Fully Integrated Rational Survey Technique (FIRST) (United Nations, 1994b) as an option for a survey programme that can be used to efficiently capture comprehensive statistical information from enterprises of all sizes operating in an economy. Application of this survey methodology requires two basic sets of statistical information, namely: (a) some census enumeration (preferably through an economic census, although a population census will generally prove sufficient) to establish the complete statistical universe for the construction of the 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 referred to as the “list-frame segment”) which are clearly distinguished by their legal status from the rest of the units;
- (b) The rest of the units (hereinafter referred to as the “non-list-frame segment”) for which drawing up an exhaustive list is not feasible and which can thus be covered only by a (geographical) area-frame approach.

7.30. In respect of the list-frame segment, either a complete enumeration or a unistage (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 subsector, on the other hand, a FIRST survey usually employs a two-stage sample design (in specific cases, it may be multistage). 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 within 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 in terms both of its scope across various economic activities and of its coverage across size classes included 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 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 cover-

age 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 reclassification of an establishment afterwards if a detailed inquiry reveals an inappropriate sector assignment at the selection stage.

7.33. In most surveys, such a unique assignment is not easy to achieve, as the members of a number of subsectors, such as tailors, shoemakers, etc., may be retailers, repairers or manufacturers according to the relative contribution of the various activities to total revenue. Evidence from different surveys in some countries suggests that the establishments concerned may have been enumerated as manufacturers in one survey and as retailers or repair shops in another, thereby inflating the level of economic activity in the country as well as incorrectly representing the structure of industrial activity. The fact that the separately conducted activity surveys have the undesirable potential to omit or duplicate units 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 timespan 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, which often plays an important role in survey design. 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 section of ISIC or from more than one are included within the survey. Thus, extension of the survey work to more activities generally entails extra costs only 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 were planned to cover various activities at the 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 organize infra-annual, smaller and focused surveys. However, integrated surveys carried out using FIRST with the same frame, and using standard sampling procedures, permit direct comparison of survey results pertaining to different activity groups, 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 subsector. The list frame is usually made up of the following groups which are easily identifiable:

- (a) Publicly traded companies (in other words, companies listed on a stock exchange);
- (b) Non-traded companies (in other words, companies registered with a government agency such as the Department of Justice, the Ministry of Industry or the like);

- (c) Government-owned enterprises (public enterprises that 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 a 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 subsector. However, estimation of the required parameters at a disaggregated, four-digit ISIC level 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 respect of 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 comprising all such units is referred to as the “certainty” or “self-representing” stratum. The size of an establishment for the purpose of 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 be covered appropriately on a sample basis for both the annual and infra-annual inquiries. Adopting an integrated sample design for both kinds of inquiries often helps resolve problems of inconsistency arising between the two sets of estimates obtained from them. Estimates of parameters of both annual and infra-annual change 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 annual estimates and obtaining reliable infra-annual estimates;
- (b) The level of cooperation of the respondents tends to decline progressively with an 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 rotating panel sampling scheme are usually free from large and unrealistic temporal variations. Moreover, use of rotation sampling permits use of composite estimates which further restricts such temporal variations resulting from sampling error;
- (d) This provides the scope for including 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 known as the non-list-frame segment. Data collection for this subsector

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 the non-list-frame segment captures complete data on 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 the 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. In principle, FIRST entails an establishment-type survey, but for the non-list-frame segment, it uses area sampling techniques. In an area sampling technique for surveying households and establishments, a sample of area units is selected at the first stage. Next, in each of the selected first-stage units, the identification and listing are required of all establishments operating in the selected area that are neither included in 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 within 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 given special treatment in this approach are those of the mobile units, for example, activities 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 owner's home located in the selected area unit as well as household-based enterprises located within the home are listed through a house-to-house (structure-to-structure) visit. In addition, the units without any fixed premises of operation, like those of hawkers, street vendors and service-providing freelancers (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. In 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 samples of establishments.

7.46. It should be noted that a partnership enterprise without fixed premises may be 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, possibly, to 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 against the household of only the partner who takes major decisions for running the enterprise.

7.47. It is desired that the sampling frame 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 fails to reflect the locations of activity-specific units. For many small-scale industrial activities, the distributions are 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 on the density of such production units.

D. Scope and coverage of various inquiries

1. Annual inquiry

7.48. There is a limit in all countries, regardless of the development of their statistical system, to the amount of 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 multistage sampling, with area units selected at the first stage and the survey conducted through interviews in most cases. Conducting annual area-frame-based surveys is generally not affordable by many countries, particularly those with a significant contribution from the non-list-frame segment, owing to the level of resources required. In such countries, the conduct of periodic surveys (once in five or three years) is required in order that the non-list-frame segment may 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,²² 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 so as to generate the short-term production-related statistics required to establish the business cycle based 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, in which case sampling techniques should be used. In countries with a significant contribution from small establishments, a large part of such activities are carried out in establishments not included 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, in cases where the resources do not permit coverage of the non-list-frame segment, the infra-annual surveys should encompass all establishments in the list frame by enumerating completely all establishments above a given size cut-off while using sampling to cover establishments below the cut-off.

3. Infrequent inquiry

7.51. Infrequent inquiries seek topical information on items that are not asked for in the annual inquiries. These inquiries are used for the collection of data on specialized topics that are not dealt with in the recommendations.

²² The term "infra-annual inquiry" here replaces the term "more-frequent-than-annual inquiry", as used in *International Recommendations for Industrial Statistics* (United Nations, 1983).

4. Baseline inquiry for the non-list-frame segment

7.52. For the countries with a 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, baseline inquiries for this segment are carried out to achieve comprehensive economic data collection. They are normally conducted every five 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 on the non-list-frame segment, or from any other inquiry of relevance.

E. Reconciling the results of infrequent or annual benchmark surveys with infra-annual surveys

7.53. Infra-annual macroeconomic 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 respect to 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 where they have 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 so as to produce timely, high-frequency estimates with 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 that optimally combine two or more sources of measurements in order to obtain reliable estimates of the series under investigation. Pursuant to the nature of the problem at hand, benchmarking techniques are generally classified as either *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 the data's 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 the 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 results in a statistical sense, as it allows 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, the proportional Denton method (Denton, 1971), the autoregressive integrated moving average (ARIMA) model-based method and regression-based methods. Detailed explanations of these methods, as well as an analysis of the available software for reconciliation, can be found in Eurostat (1999) and Bloem, Dippelsman and Maehle (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, preferably the (Gregorian) calendar year. With the data so compiled, there should be few, if any, problems, as far as the reference period is concerned, in integrating data from those inquiries. 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 a calendar-year basis to facilitate the building up of 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 on a calendar-year basis. There are advantages to be derived from the submission by all establishments of returns covering an identical 12-month period, particularly in respect of 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 estimate the period that they cover.

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 eliminating 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 inquiries, the reference period may still cause problems. If the units in the annual inquiry report are for varying 12-month periods (that is to say, if some are for the calendar year and others are for the fiscal year), then integration of 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 respect of scope, coverage and statistical units may make it difficult to integrate the results of the two types of inquiry in this way, and problems arising from this source will be compounded by the normally provisional nature of the data reported in the infra-annual inquiries.

Chapter 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 starting from the collection and processing of data to compilation and dissemination of statistics. Quality measurement of industrial statistics is concerned with providing users with sufficient information to judge whether or not the data are of adequate quality for their intended use, that is to say, 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 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 quality management.

8.2. Several statistical organizations and countries²³ 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 figure VIII.1), they complement each other and provide comprehensive and flexible structures for the qualitative assessment of a broad range of statistics. For example:

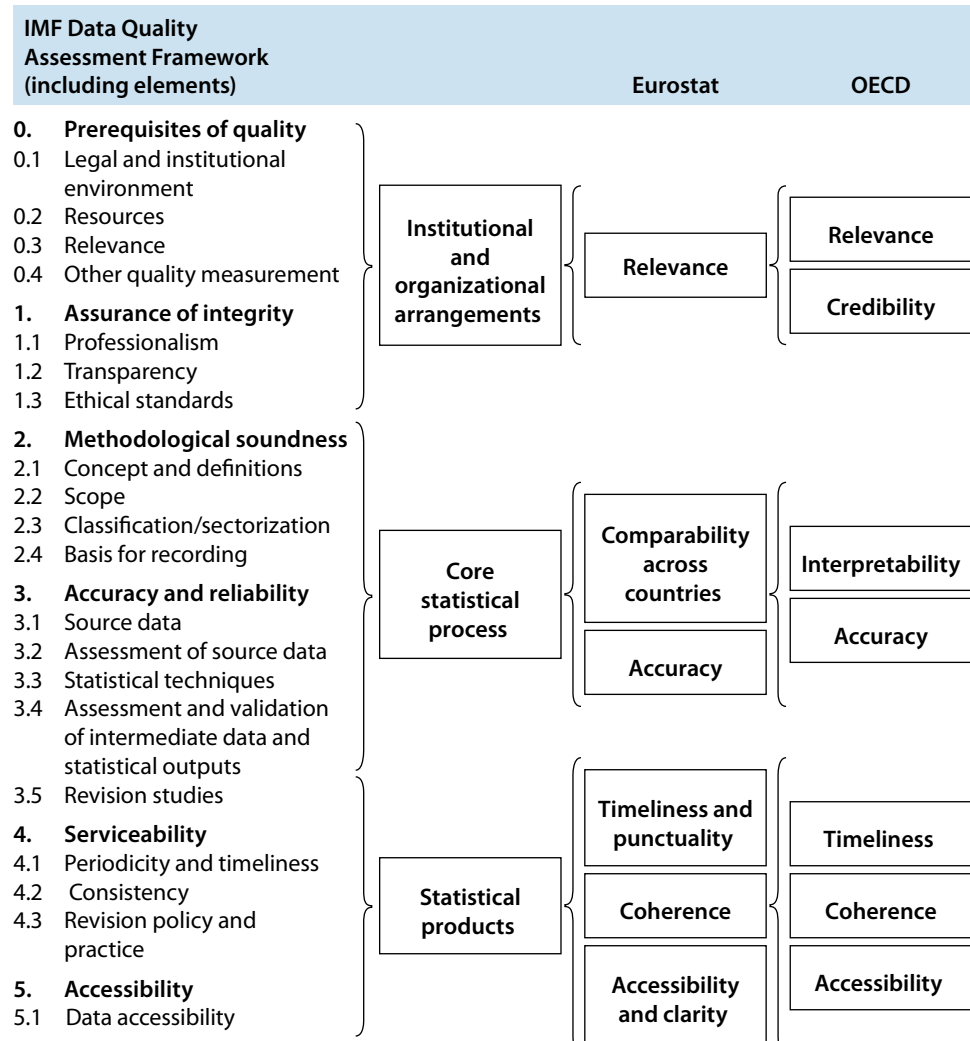
- (a) The *IMF Data Quality Assessment Framework (DQAF)* takes a holistic view of data quality and includes governance of statistical systems, core statistical processes and statistical products. The Framework is organized as a cascading structure covering the prerequisites and five dimensions of quality: assurance of integrity, methodological soundness, accuracy and reliability, serviceability and accessibility;
- (b) 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;
- (c) The *OECD quality measurement framework* views quality as a multifaceted concept. As with the Eurostat approach, the quality characteristics depend on user perspectives, needs and priorities, which vary across groups of users. Quality is viewed in terms of seven dimensions: relevance, accuracy, credibility, timeliness, accessibility, interpretability and coherence.

8.3. The overall aim of quality assessment frameworks is to standardize and systematize 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

²³ See, inter alia, (a) International Monetary Fund, Data Quality Assessment Framework (<http://dsbb.imf.org/Applications/web/dqrs/dqrsdqaf/>); (b) Eurostat, Working Group, “Assessment of quality in statistics”, “Definition of quality in statistics” (document Eurostat/A4/Quality/03/General/Definition), prepared for the sixth meeting (Luxembourg, 2 and 3 October 2003); (c) Organization for Economic Cooperation and Development (OECD), Statistics Directorate, “Quality framework for OECD statistics” (Paris, June 2002); (d) United Kingdom of Great Britain and Northern Ireland, Office for National Statistics, *Guidelines for Measuring Statistical Quality*, version 3.1 (London, 2007); (e) *Statistics Canada’s Quality Assurance Framework* (Ottawa, September 2002); and (f) Statistics Finland, *Quality Guidance for Official Statistics*, 2nd revised ed. (Helsinki, 2007), etc.

Figure VIII.1

The relationship between the International Monetary Fund Data Quality Assessment Framework, the Eurostat quality definition and the Organization for Economic Cooperation and Development quality measurement framework



Source: Lucie Laliberte (IMF), Werner Grunewald and Laurent Probst (Eurostat) "Data quality: a comparison of IMF's data quality assessment framework (DQAF) and Eurostat's quality definition" (January 2004); available from http://dsbb.imf.org/vgn/images/pdfs/dqaf_eurostat.pdf. The last column showing the relationship with the OECD quality measurement framework was contributed by the United Nations Statistics Division.

be used in a number of contexts, including for (a) guiding countries' efforts towards strengthening their statistical systems by providing a self-assessment tool and a means of identifying areas for improvement; (b) technical assistance purposes; (c) reviews of particular statistical domains, as performed by international organizations; and (d) assessment by other groups of data users.

Dimensions of quality

8.4. Either national statistical offices may use the existing frameworks for quality assessment of industrial statistics directly or they can develop their own national quality assessment frameworks—frameworks that fit best their country's practices 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. These reflect a

broad perspective on quality and in consequence have been incorporated in most of the existing frameworks. They are described in detail directly below:

- (a) *Prerequisites of quality.* Prerequisites of quality refer to all institutional and organizational 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;
- (b) *Relevance.* The relevance of industrial statistics reflects the degree to which they meet 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 with a view to producing a programme that goes as far as possible towards 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, and the identified gaps between key user interests and compiled industrial statistics in terms of concepts, coverage and details;
- (c) *Credibility.* The credibility (referred to as assurance of integrity in the IMF Data Quality Assessment Framework) of industrial statistics refers to the confidence that users place in those data and in 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, which implies that the data are perceived to have been produced professionally in accordance with appropriate statistical standards, and that policies and practices are transparent. For example, data should not be manipulated, nor should their release be timed in response to political pressure;
- (d) *Accuracy.* The accuracy of industrial statistics refers to the degree to which the data correctly estimate or describe the quantities or characteristics that they have been designed to measure. It has many facets and in practice there is no single aggregate for, 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 it also encompasses the 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 following indicators: coverage, sampling errors, non-response errors, response errors, processing errors, and measuring and model errors. Revisions and revision studies of industrial statistics undertaken at regular intervals are considered a gauge of reliability;
- (e) *Timeliness.* The timeliness of industrial statistics is a function of 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 time frame. Timeliness is closely tied to the existence of a publication schedule. A publication schedule may comprise a set of target release dates or may entail a commitment to release industrial data within a prescribed time period following their receipt. This factor usually involves a trade-

off with respect to accuracy. The timeliness of information also influences its relevance. Punctuality is another measure of timeliness. It reflects the amount of time elapsing between the identified release date and the effective date of dissemination of industrial statistics;

- (f) *Methodological soundness.* Methodological soundness is a dimension that encompasses the application of international standards, guidelines and good practices in the production of industrial statistics. The adequacy of the definitions and concepts, target populations, variables and terminology underlying the data, and of the information describing the limitations of the data, if any, largely determines the degree of adherence of a particular data set to international standards. The metadata provided along with industrial statistics play a crucial role in assessing the methodological soundness of data. They inform the users on how close to the target variable (for example, any of the data items) are the input variables used for its estimation. When there is a significant difference, there should be an explanation of the extent to which this may cause a bias in the estimation. Methodological soundness is closely related to the interpretability of data, which depends on all of the features of the information on industrial data mentioned above and reflects the ease with which the user may understand and properly use and analyse the data;
- (g) *Coherence.* The coherence of industrial statistics reflects the degree to which the data are logically connected and mutually consistent, that is to say, the degree to which 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 a common methodology across surveys. Coherence, which does not necessarily imply full numerical consistency, has four important sub-dimensions:
- (i) *Coherence within a data set.* This 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 reflects the fact that all data items have been compiled in conformity with the methodological basis of the recommendations presented in this publication;
 - (ii) *Coherence across data sets.* This 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 as long as any differences are explained and can be allowed for;
 - (iii) *Coherence over time.* This implies that the data are based on common concepts, definitions and methodology over time. This property will be established if, for example, the entire time series of industrial statistics is compiled on the basis of the international recommendations for industrial statistics. Countries are encouraged to clearly indicate deviations from the international recommendations, if any;
 - (iv) *Coherence across countries.* This implies that the data are based on common concepts, definitions and methodology across countries. Coherence of industrial statistics across countries may depend on the extent of the implementation of the international recommendations;

- (h) *Accessibility.* The accessibility of industrial statistics refers to the ease with which they can be obtained from the statistical office, including 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. Aspects of accessibility also include the availability of metadata and the existence of user support services. Accessibility requires development of an advance release calendar so that users are informed well in advance on when and where the data will be available and how to access them.

8.5. These dimensions of quality are overlapping and interconnected and as such are involved in a complex relationship. Action taken to address or modify one aspect of quality will tend to affect other aspects. For example, there may be a trade-off between aiming for the most accurate estimation of the total annual production of industrial units, and providing this information in a timely manner and when it is still of interest to users. If countries, in compiling a particular industrial statistics data set, are not in a position to meet the accuracy and timeliness requirements simultaneously, they should produce a provisional estimate, which would be available soon after the end of the reference period but would be based on less comprehensive data content. This estimate would be supplemented at a later date with information based on more comprehensive data content but would be less timely than its provisional version. If there is no conflict between these two quality dimensions, there will of course be no need to produce such estimates.

8.6. Measuring the quality of industrial statistics is not a simple task. Inasmuch as problems arise in respect of both quantifying the levels of individual dimensions and aggregating the levels of all dimensions, 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 sect. 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 offers 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 data set meets their particular quality requirements. A 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 measures.

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 respect 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, the response rate is often utilized as a quality indicator to provide a measure of the possible extent of non-response bias.

8.10. It is not intended 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 data set. Certain types of quality measures and indicators may be produced for each data item; for example, item response rate for 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 rewritten only if there were 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 (f)) which would be applicable to all data items of industrial statistics.

8.11. The quality indicators used for industrial statistics should be easy to interpret and the methodology for their compilation should be well established. They may cover part or all of the dimensions of quality as previously defined. Quality indicators can be classified as:

- (a) *Key indicators*: those that provide the direct measure of 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 the first release of data, measuring the timeliness of industrial statistics;
- (b) *Supportive indicators*: those that provide an indirect measure of data quality, for example, the average size of revisions undertaken between provisional and final estimates of a particular data set, which measures the accuracy of industrial statistics;
- (c) *Indicators for further analysis*, which are subject to further examination and discussion on the part 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 that a correct balance between different dimensions of quality and the number of indicators be maintained. The objective of quality measurement is to have a limited set (minimum number) of indicators which can be used to measure and follow over time the quality of the industrial statistics produced by the statistical office and to ensure that the users are provided with a useful summary of overall quality, while not overburdening respondents with demands for additional quality metadata.

8.13. Table VIII.I presents a limited set of key indicators²⁴ which countries are encouraged to use on a regular basis for measuring the quality of industrial statistics. Their utilization is easy to implement and they provide users with a clear and up-to-date overview of the overall quality of industrial statistics.

C. Metadata on industrial statistics

8.14. *Content of statistical data*. Generally, statistical data consist 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 that describe the microdata, macrodata or other metadata.

²⁴ 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) the IMF data quality assessment framework website at <http://dsbb.imf.org/Applications/web/dqrs/dqrsdqaf/>; and (c) the United Kingdom of Great Britain and Northern Ireland Office for National Statistics, Guidelines for Measuring Statistical Quality, available from <http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=13578>.

Table VIII.1
Minimum set of key quality indicators

Quality dimension	Quality measure/indicator
Relevance	R ₁ . Identification of gaps between key user interests and compiled industrial statistics in terms of concepts, coverage and detail
	R ₂ . Users' satisfaction surveys
Accuracy	A ₁ . Sampling errors of estimates - Coefficient of variation
	A ₂ . Non-sampling errors - Unit response rate - Item response rate
	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 divergences from the relevant international statistical standards in concepts and measurement procedures used in the collection/compilation of industrial statistics
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
	AC ₂ . Industrial statistics data sets made available, by mode of dissemination, as a percentage of total industrial data sets produced

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 content of data and to encompass administrative facts about data (who has created them and when) and how data were collected and processed before they were disseminated or stored in a database. In addition, metadata facilitate an efficient search for and location of data.

8.16. *Statistical metadata*. Statistical metadata describe or document statistical data, that is to say, 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 has been 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 makes it necessary for a broad spectrum of metadata requirements to be addressed. In particular, the statistical offices as data suppliers must make sufficient metadata available to enable both the least and the most sophisticated users to readily assess the data quality. Countries may develop a layered approach to metadata presentation for groups of users in which each successive layer provides more detail. Representing a minimum segmentation, the following two levels of metadata may be presented:

- (a) *Structural metadata* presented as an integral part of the data tables;

- (b) *Reference metadata* providing details on the content and quality of data which may accompany the tables or be presented separately via the Internet or in occasional publications.

8.19. Metadata provide 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 harmonization 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 the users of industrial statistics understand, analyse and interpret the data, even if they have not themselves participated in the process of the production of those data. In other words, industrial statistics metadata should help users transform statistical data into information. The metadata is helpful to producers of statistics as well. The new knowledge gained from interpreting the data may also lead to enhancements of both production (through lowering the costs and improving the data quality) and dissemination (through dissemination of comprehensive, timely, accessible and reliable data).

8.21. The metadata of the disseminated industrial statistics should encompass the following six main components: (a) data coverage, periodicity and timeliness; (b) access by the public; (c) integrity of disseminated data; (d) data quality; (e) summary methodology; and (f) dissemination formats. Each of these components may be characterized by a few elements which can be observed or monitored by the users.

8.22. Countries are encouraged to accord the development of metadata a high priority and to consider their dissemination an integral part of the dissemination of industrial statistics. Moreover, it is desirable that in consideration of the integrated approach to the compilation of economic statistics, a coherent system and a structured approach to metadata across all areas of economic statistics be developed and adopted, focusing on improving their quantity and coverage.

8.23. The Statistical Data and Metadata Exchange (SDMX)²⁵ technical standards and content-oriented guidelines provide common formats and nomenclatures for exchange and sharing of statistical data and metadata using modern technology. Countries are encouraged to use Web technology and SDMX standards in dissemination of their national data and metadata as a means of reducing the international reporting burden. Various international organizations such as the International Monetary Fund, Eurostat and the Organization for Economic Cooperation and Development have developed metadata standards and have collected metadata for different areas of statistics.

²⁵ For further details, see <http://www.sdmx.org/>.

Chapter IX

Dissemination of industrial statistics

A. Dissemination

9.1. Data dissemination consists of distribution or transmission of statistical data to policymakers, the business community and other users. It is one of the highly important activities of the national statistical office. Statistical authorities collect data using the legal authority derived from national statistical acts and regulations, which require that the data provided by the respondents 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 governed by three benchmarks: confidentiality, equality and objectivity (Eurostat, 1998). These benchmarks are discussed directly below.

1. Statistical confidentiality

9.3. The data furnished by statistical units relating to their businesses is considered to be confidential and should be used exclusively for statistical purposes. Breaching of the confidentiality of disseminated data occurs when a reporting unit has been identified either directly or indirectly, with the consequent disclosure of the information it individually provided. Breaching of confidentiality runs the risk of harming the relationship between the national statistical office and respondents and users. Respondents could become wary regarding the protection of their privacy and might not cooperate with the national statistical office with respect to supplying information in future. The users on the other hand could seriously question the independence of the national statistical office along with the objectiveness and reliability of the data. Principle 6 of the United Nations Fundamental Principles of Official Statistics provides the basis for managing statistical confidentiality. It states:

Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes (United Nations Statistical Commission, 1994a).

9.4. The results of an industrial survey are usually published in the form of tables which contain aggregated information on a number of respondents, rather than information on individual respondents. Sometimes, it is possible to deduce information about an individual respondent from the total, especially when the contribution of one respondent dominates that 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 used to reduce the risk of disclosing

information on individual reporting units. While application of such methods occurs at the dissemination stage, they are pertinent to all stages of the statistical process.

9.6. As the first step in 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 cannot be published.

9.7. The logic behind 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 its 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 three units. For cells with largest numbers, the three units with the largest values should together not dominate, that is to say, they account for less than 70 per cent of the cell value.

9.9. The most common practices carried out to protect the disclosure of confidential data include:

- (a) *Aggregation.* A confidential cell in a table is aggregated with another cell and the information is then disseminated for the aggregate and not for the two individual cells. This, for example, often results in grouping of industrial data at the class (four-digit) level of ISIC that are confidential with data from another class and presenting and disseminating them at the group (three-digit) level of ISIC;
- (b) *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 in the others (primary suppression). Suppressing only one cell in a table means, however, that the calculation of totals for the higher levels to which that cell belongs cannot be performed. In this case, other cells must also be suppressed to guarantee the protection of the values under the primary cells, leading to secondary suppression;
- (c) *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 organizations depend to a large degree on the quality and completeness of the data supplied by countries. Therefore, not only does the issue of confidentiality have a national dimension, but it is also becoming international in scope for the following reasons: (a) increase of data dissemination over the Internet; (b) internationalization of users of statistical data (including international organizations); and (c) high degree of interest in cross-

country comparisons. As a result, there is a growing demand for countries' data at a very detailed level and, in some cases, even a demand for countries' microdata.

2. Equality

9.11. The fact that statistics compiled by national statistical offices are collective goods implies that no users are privileged and that every citizen can have access to 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, a press release represents the first form of publication. The press release serves a dual purpose in that, apart from making the data officially public, it also signals to data users the fact 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 the issuance of an advance release calendar. The advance release calendar should be given sufficient publicity and should also be posted on the national statistical office website in the 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 45 days after the end of the reference month; their quarterly data, 3 months after the end of the quarter; and their annual data, 18 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 should not be derived as the difference between the annual totals and the sum for the first three quarters.

3. Objectivity

9.14. Released data should not be accompanied by judgements 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 country practices in respect of the compilation of industrial statistics. Revision of estimates is an unavoidable statistical activity in all countries, both developed and developing. It is intrinsic to the basic stages through which estimates are compiled and released by the national statistical offices: the "preliminary" (based mainly on trends in indicators and statistical techniques), the "provisional" (based on limited amounts of data) and the "final" (based on comprehensive data or entailing the use of benchmarking). The production of revisions is a consequence of the trade-off between the timeliness of published data and their reliability, accuracy and comprehensiveness. To meet user need, national statistical offices compile timely preliminary estimates which are later revised once new and more accurate information becomes 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 ultimately fail to satisfy users' needs. The revisions affect both annual and infra-annual statistics but they are more significant for infra-annual data.

1. Reasons for revisions of data

9.16. In general, there are two types of revisions: (a) revisions arising from “normal” statistical procedures (for instance, availability of new information, change in the methodology, change in data source, change of base year); and (b) revisions in the form of 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 arising from changes in concepts, definitions or classifications.

9.17. It is essential that corrections of errors (statistical or data-processing errors) be carried out in a transparent manner as soon as they are detected. The revisions should be explained to the users in such a way as to provide assurance that the mistakes were not politically motivated. For normal statistical data revisions, countries should develop a revision policy. The development of a revision policy should be aimed not at impeding revisions but rather at providing users with the information necessary for coping with revisions in a more systematic manner. Essential features of a well-established revision policy are a predetermined schedule, reasonable stability from year to year, openness, provision of advance notice of reasons and effects, and ease of 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 a predetermined schedule.

2. Best practices for data revisions

9.18. There is a need for good practices with regard to data revisions to be followed by countries, as this will not only help the national users of the data but also promote international consistency. Countries are encouraged to adopt and put into practice the following revision recommendations (see Organization for Economic Cooperation and Development, 2007b):

- (a) It is important that the main users of official statistics be consulted so that needs and priorities specific to individual countries may be identified;
- (b) A statement by the national statistical office about the reasons for and the schedule of revisions should be made public and readily accessible to users;
- (c) The revision cycle should be relatively stable from year to year, inasmuch as users place great importance on a revision schedule that is regular;
- (d) Major conceptual and methodological revisions should usually be introduced every four to six years, balancing the need for change and users’ concerns;
- (e) Revisions should be carried back several years to yield consistent time series;
- (f) Details of revisions should be documented and made available to users. The basic documentation should include identification in the statistical publications of data that are preliminary (or provisional) and revised data, identification of the sources of the revisions, and explanations of breaks in series when consistent series cannot be constructed;
- (g) Users should be reminded of the size of the likely revisions based on past history.

C. Dissemination formats

9.19. Industrial statistics can be disseminated both electronically (online or on CD-ROMs) and in paper publications. Countries should choose the dissemination format that best suits their users' needs. 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 need 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 that are routinely disseminated, the requisite data can be made available by statistical offices to users on request. For some specific purposes, customized tabulations of data (non-standard activity classification, specific types of units, etc.) can be provided. Countries are encouraged to ensure that users are informed of the availability of additional statistics and the procedures for obtaining them.

9.20. *Dissemination of metadata.* Metadata and quality assessment of industrial statistics are as important to users as the data themselves. Countries are encouraged to develop and disseminate metadata comprising the following components: (a) data coverage, periodicity and timeliness; (b) access by the public; (c) integrity of disseminated data; (d) data quality; (e) summary methodology; and (f) dissemination formats. All deviations from internationally accepted statistical standards and guidelines should be clearly indicated. Industrial statistics metadata should be made readily accessible through statistical offices' websites and/or publications. Countries might consider developing different levels of detail of metadata so as to meet the requirements and needs of specialized users.

ANNEXES

Annex I

Economic activities in terms of the International Standard Industrial Classification of All Economic Activities, Revision 4, within the scope of industrial statistics

Section B Mining and quarrying

Division	Group	Class	Description
Division 05			Mining of coal and lignite
	051	0510	Mining of hard coal
	052	0520	Mining of lignite
Division 06			Extraction of crude petroleum and natural gas
	061	0610	Extraction of crude petroleum
	062	0620	Extraction of natural gas
Division 07			Mining of metal ores
	071	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
Division 08			Other mining and quarrying
	081	0810	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.
Division 09			Mining support service activities
	091	0910	Support activities for petroleum and natural gas extraction
	099	0990	Support activities for other mining and quarrying

Section C

Manufacturing

Division	Group	Class	Description
Division 10			Manufacture of food products
	101	1010	Processing and preserving of meat
	102	1020	Processing and preserving of fish, crustaceans and molluscs
	103	1030	Processing and preserving of fruit and vegetables
	104	1040	Manufacture of vegetable and animal oils and fats
	105	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	1080	Manufacture of prepared animal feeds
Division 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
Division 12			Manufacture of tobacco products
	120	1200	Manufacture of tobacco products
Division 13			Manufacture of textiles
	131		Spinning, weaving and finishing of textiles
		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.
Division 14			Manufacture of wearing apparel
	141	1410	Manufacture of wearing apparel, except fur apparel
	142	1420	Manufacture of articles of fur
	143	1430	Manufacture of knitted and crocheted apparel

Division	Group	Class	Description
Division 15			Manufacture of leather and related products
	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	1520	Manufacture of footwear
Division 16			Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
	161	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
Division 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
Division 18			Printing and reproduction of recorded media
	181		Printing and service activities related to printing
		1811	Printing
		1812	Service activities related to printing
	182	1820	Reproduction of recorded media
Division 19			Manufacture of coke and refined petroleum products
	191	1910	Manufacture of coke oven products
	192	1920	Manufacture of refined petroleum products
Division 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

Division	Group	Class	Description
		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
		2029	Manufacture of other chemical products n.e.c.
	203	2030	Manufacture of man-made fibres
Division 21			Manufacture of basic pharmaceutical products and pharmaceutical preparations
	210	2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products
Division 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	2220	Manufacture of plastics products
Division 23			Manufacture of other non-metallic mineral products
	231	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.
Division 24			Manufacture of basic metals
	241	2410	Manufacture of basic iron and steel
	241	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
Division 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	2520	Manufacture of weapons and ammunition
	259		Manufacture of other fabricated metal products; metalworking service activities

Division	Group	Class	Description
		2591	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
		2592	Treatment and coating of metals; machining
		2593	Manufacture of cutlery, hand tools and general hardware
		2599	Manufacture of other fabricated metal products n.e.c.
Division 26			Manufacture of computer, electronic and optical products
	261	2610	Manufacture of electronic components and boards
	262	2620	Manufacture of computers and peripheral equipment
	263	2630	Manufacture of communication equipment
	264	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	2660	Manufacture of irradiation, electromedical and electrotherapeutic equipment
	267	2670	Manufacture of optical instruments and photographic equipment
	268	2680	Manufacture of magnetic and optical media
Division 27			Manufacture of electrical equipment
	271	2710	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
	272	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	2740	Manufacture of electric lighting equipment
	275	2750	Manufacture of domestic appliances
	279	2790	Manufacture of other electrical equipment
Division 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
		2816	Manufacture of lifting and handling equipment

Division	Group	Class	Description
		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
Division 29			Manufacture of motor vehicles, trailers and semi-trailers
	291	2910	Manufacture of motor vehicles
	292	2920	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
	293	2930	Manufacture of parts and accessories for motor vehicles
Division 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	3020	Manufacture of railway locomotives and rolling stock
	303	3030	Manufacture of air and spacecraft and related machinery
	304	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.
Division 31			Manufacture of furniture
	310	3100	Manufacture of furniture
Division 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	3220	Manufacture of musical instruments
	323	3230	Manufacture of sports goods
	324	3240	Manufacture of games and toys
	325	3250	Manufacture of medical and dental instruments and supplies
	329	3290	Other manufacturing n.e.c.

Division	Group	Class	Description
Division 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	3320	Installation of industrial machinery and equipment

Section D

Electricity, gas, steam and air-conditioning supply

Division	Group	Class	Description
Division 35			Electricity, gas, steam and air-conditioning supply
	351	3510	Electric power generation, transmission and distribution
	352	3520	Manufacture of gas; distribution of gaseous fuels through mains
	353	3530	Steam and air-conditioning supply

Section E

Water supply, sewerage, waste management and remediation activities

Division	Group	Class	Description
Division 36			Water collection, treatment and supply
	360	3600	Water collection, treatment and supply
Division 37			Sewerage
	370	3700	Sewerage
Division 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	3830	Materials recovery
Division 39			Remediation activities and other waste management services
	390	3900	Remediation activities and other waste management services

Annex II

Identifying the principal activity of a statistical unit using the top-down method

The “top-down” method

The top-down method follows a hierarchic 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 as follows:

- Step 1. Identify the section that has the highest share of the value added;
- Step 2. Within this section, identify the division that has the highest share of the value added;
- Step 3. Within this division, identify the group that has the highest share of the value added (except in the case of wholesale and retail trade activities);
- Step 4. Within this group, identify the class that has the highest share of value added.

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 (percentage)	
C	25	251	2512	Manufacture of tanks, reservoirs and containers of metal	7	
	28	282	281	2816	Manufacture of lifting and handling equipment	8
			2821	2821	Manufacture of agricultural and forestry machinery	3
			2822	2822	Manufacture of metal-forming machinery and machine tools	21
			2824	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 (percentage)
C	Manufacturing	52
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	35
M	Professional, scientific and technical activities	13

Step 2.

Identify the division (within section C)

Division	Description	Share of value added (percentage)
25	Manufacture of fabricated metal products, except machinery and equipment	7
28	Manufacture of machinery and equipment n.e.c.	40
29	Manufacture of motor vehicles, trailers and semi-trailers	5

Step 3.

Identify the group (within division 28)

Group	Description	Share of value added (percentage)
281	Manufacture of general-purpose machinery	8
282	Manufacture of special-purchase machinery	32

Step 4.

Identify the class (within group 282)

Class	Description	Share of value added (percentage)
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

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 results in the following: a reporting unit with a value added share of 52 per cent in manufacturing would be classified outside of manufacturing.

References

- Augeraud, Patrick, and Jean-Etienne Chapron (2000). Using business accounts to compile national accounts: the French experience. In *Links between Business Accounting and National Accounting: Handbook of National Accounting*. Studies in Methods, No. 76. Sales No. E.00.XVII.13.Chap.IV.
- Bloem, Adriaan M., Robert J. Dippelsman and Nils Ø. Maehle (2001). *Quarterly National Accounts Manual: Concepts, Data Sources, and Compilation*. International Monetary Fund, Washington, D. C.
- Commission of the European Communities, International Monetary Fund, Organization for Economic Cooperation and Development, United Nations and World Bank (2009). *System of National Accounts 2008*. Studies in Methods, Series F/2 Rev.5. Sales No. E.08.XVII.29.
- Commission of the European Communities, Organization for Economic Cooperation and Development, World Tourism Organization and United Nations (2001). *Tourism Satellite Account: Recommended Methodological Framework*. Sales No. E.01.XVII.9. Available from http://unstats.un.org/unsd/publication/SeriesF/SeriesF_80E.pdf.
- Denton, F. T. (1971). Adjustment of monthly or quarterly series to annual totals: an approach based on quadratic minimization. *Journal of the American Statistical Association*, vol. 66, No. 333 (March), pp. 99-102.
- European Commission (1996). *European System of Accounts: ESA 1995*. Luxembourg: Office for Official Publications of the European Communities.
- Eurostat (2002). *SERIEE Environmental Protection Expenditure Accounts: Compilation Guide, Methods and Nomenclatures*. Luxembourg: Office for Official Publications of the European Communities.
- Eurostat (1996). Council of the European Union regulation (EC, Euratom) No. 58/97 of 20 December 1996 concerning structural business statistics. Available from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997R0058:EN:HTML>.
- ____ (1998). *Handbook on the Design and Implementation of Business Surveys*. Luxembourg. March.
- ____ (1999). *Handbook on Quarterly National Accounts*. Luxembourg: Office for Official Publications of the European Communities.
- ____ (2002). *Manual of Business Statistics*. Chap. 5, Business registers. July. Available from http://circa.europa.eu/irc/dsis/bmethods/info/data/new/embs/registers/embs1_5.html.
- ____ and Organization for Economic Cooperation and Development (2007). *Eurostat-OECD Manual on Business Demography Statistics*, 2007 ed. *Methodologies and Working Papers*. Luxembourg: Office for Official Publications of the Euro-

pean Communities 2007. Available from http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-07-010/EN/KS-RA-07-010-EN.PDF.

Fellegi, I. P., and D. Holt (1976). A systematic approach to automatic edit and imputation. *Journal of the American Statistical Association*, vol. 71, No. 353 (March), pp. 17-35.

International Labour Organization (1962). Resolution concerning statistics of hours of work, adopted by the Tenth International Conference of Labour Statisticians (11 October 1962). Available from <http://www.ilo.org/public/english/bureau/stat/res/index.htm>.

_____ (1982). Resolution concerning statistics of the economically active population, employment, unemployment and underemployment, adopted by the Thirteenth International Conference of Labour Statisticians (October 1982).

_____ (1993a). Resolution concerning the International Classification of Status in Employment, adopted by the Fifteenth International Conference of Labour Statisticians (January 1993). Available from <http://www.ilo.org/public/english/bureau/stat/download/res/icse.pdf>.

_____ (1993b). Resolution concerning statistics of employment in the informal sector, adopted by the Fifteenth International Conference of Labour Statisticians (January 1993). Available from <http://www.ilo.org/public/english/bureau/stat/download/res/infsec.pdf>.

International Monetary Fund, Statistics Department (2008). Balance of Payments and International Investment Position Manual, sixth ed. (BPM6). December 2008. Available from <http://www.imf.org/external/pubs/ft/bop/2007/bopman6.htm>.

Organization for Economic Cooperation and Development (2002a). *Measuring the Non-Observed Economy: A Handbook*. Paris: OECD. Available from <http://www.oecd.org/dataoecd/9/20/1963116.pdf>.

_____ (2002b). *Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development*. Paris: OECD. Available from http://www.tubitak.gov.tr/tubitak_content_files/BTYPD/kilavuzlar/Frascati.pdf.

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

_____ (2007b). *Data and Metadata Reporting and Presentation Handbook*. Paris: Statistics Directorate, OECD. Available from <http://www.oecd.org/dataoecd/46/17/37671574.pdf>.

Rubin, D. B. (1987). *Multiple Imputation for Nonresponse in Surveys*. New York: John Wiley & Sons.

United Nations (1953). *International Standards in Basic Industrial Statistics*. Statistical Papers, No. 17. Sales No. E.1953.XVII.7.

_____ (1958). *International Recommendations in Statistics of Distribution*. Statistical Papers, No. 26. Sales No. E.58.XVII.4.

_____ (1960). *International Recommendations in Basic Industrial Statistics: A Guide to Objectives and Definitions*. Statistical Papers, No. 17, Rev.1. Sales No. E.60.XVII.8.

- _____. (1968a). *International Recommendations for Industrial Statistics*. Statistical Papers, No. 48. Sales No. E.68.XVII.10.
- _____. (1968b). *International Recommendations for Construction Statistics*. Statistical Papers, No. 47. Sales No. E.68.XVII.11.
- _____. (1975). *International Recommendations on Statistics of the Distributive Trades and Services*. Statistical Papers, No. 57. Sales No. E.75.XVII.9. Available from http://unstats.un.org/unsd/publication/SeriesM/SeriesM_57E.pdf.
- _____. (1982). *Concepts and Methods in Energy Statistics, with Special Reference to Energy Accounts and Balances: A Technical Report*. Studies in Methods, No. 29. Sales No. 82.XVII.13. Available from http://unstats.un.org/unsd/publication/SeriesF/SeriesF_29E.pdf.
- _____. (1983). *International Recommendations for Industrial Statistics*. Statistical Papers, No. 48, Rev.1. Sales No. E.83.XVII.8. Available from http://unstats.un.org/unsd/publication/SeriesM/SeriesM_48rev1E.pdf.
- _____. (1994a). Fundamental Principles of Official Statistics. *Official Records of the Economic and Social Council, 1994, Supplement No. 9 (E/1994/29)*, chap. V, para. 59. The report of the Statistical Commission is also available from <http://unstats.un.org/unsd/statcom/94report.pdf>.
- _____. (1994b). *Strategies for Measuring Industrial Structure and Growth*. Studies in Methods, No. 65. Sales No. E.94.XVII.11. Available from http://unstats.un.org/unsd/publication/SeriesF/SeriesF_65E.pdf.
- _____. (1997). *International Recommendations for Construction Statistics*. Statistical Papers, No. 47, Rev.1. Sales No. E.97.XVII.11. Available from http://unstats.un.org/unsd/publication/SeriesM/SeriesM_47rev1E.pdf.
- _____. (2000). *Links between Business Accounting and National Accounting: Handbook of National Accounting*. Studies in Methods, No. 76. Sales No. E.00.XVII.13. Available from http://unstats.un.org/unsd/publication/SeriesF/SeriesF_76E.pdf.
- _____. (2005). Principles governing international statistical activities. New York: United Nations Statistics Division. Available from http://unstats.un.org/unsd/methods/statorg/Principles_stat_activities/principles_stat_activities.asp.
- _____. (2006). Report of the Statistical Commission on its thirty-seventh session (7-10 March 2006). *Official Records of the Economic and Social Council, 2006, Supplement No. 4. E/2006/24. Chap. I, sect. C, decision 37/101*. Available from <http://unstats.un.org/unsd/statcom/doc06/Report-English.pdf>.
- _____. (2008a). Central Product Classification (CPC), Version 2. Statistical Papers, Series M, No. 77, Version 2. Sales No. E.08.XVII.26. Available from <http://unstats.un.org/unsd/cr/registry/cpc-2.asp>.
- _____. (2008b). UN List of Industrial Products. Available from <http://unstats.un.org/unsd/industry/commoditylist2.asp?s=0>.
- _____. (2008c). *International Standard Industrial Classification of All Economic Activities, Revision 4*. Statistical Papers, No. 4/Rev.4. Sales No. E.08.XVII.25.
- _____. Commission of the European Communities, International Monetary Fund, Organisation for Economic Cooperation and Development, World Bank (2009). *System of National Accounts 2008*. Studies in Methods, Series F/2 Rev.5. Sales No. E.08.XVII.29, also available from <http://unstats.un.org/unsd/nationalaccount/SNA2008.pdf>.



USD 70
ISBN 978-92-1-161511-1



Printed at the United Nations, New York

07-66523—December 2009—2,205