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Occupations in Information and Communications Technology

Options for Updating the International Standard Classification of Occupations¹

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POLICY INTEGRATION DEPARTMENT
BUREAU OF STATISTICS

¹ This paper was prepared by David Hunter of the ILO Bureau of Statistics. The views expressed are his own and do not necessarily represent the views of the ILO.

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Introduction

1 In recent years, issues of labour market supply and demand in occupations associated with information and communications technology (ICT) have been major concerns in government and in the private sector at both national and international levels. Policy debate about these issues, however, has not been well informed by good quality statistical information on the occupational structure of the ICT labour market. This has been due in part to the absence of an appropriate framework and agreed terminology for describing and quantifying ICT occupations. The update of the International Standard Classification of Occupations (ISCO) offers a timely opportunity to address this problem.

2 This paper provides some background information about ISCO and summarises some of the data problems and policy issues associated with the ICT labour market. It briefly outlines the progress that has been made so far and presents a draft framework for the classification of ICT occupations. This framework is intended as a stimulus to promote discussion rather than as a definitive solution. It concludes by identifying the issues that will need to be resolved before the update of ISCO can be finalised.²

Background

3 The purposes of ISCO are:

- to provide a basis for the international comparison and exchange of statistical and administrative data about occupations;
- to provide a model for the development of national and regional classifications of occupations; and
- to provide a system that can be used directly or with minor adaptations in countries that have not developed their own national classifications.

4 Occupation classification systems are used in national contexts for the collection and dissemination of statistics from population censuses, household surveys, employer surveys and other sources. They are also used in a wide range of administrative and policy-related activities such as matching job seekers with job vacancies, educational planning, and the management of employment related international migration.

² The present version of this paper is provided as a resource for those preparing responses to the second questionnaire on updating ISCO-88. It has been revised to reflect recent changes in the draft ISCO-08 structure but is otherwise the same as the paper circulated in April 2006.

5 The current version of ISCO (ISCO-88) was developed during the mid to late eighties and was adopted by the Fourteenth International Conference of Labour Statisticians in 1987. The rapid changes that have taken place since that time in information and communications technologies, and the influence of these changes on the occupational structure of the labour market, were significant factors influencing the decision by the Seventeenth International Conference of Labour Statisticians in 2003 to ask the International Labour Office (ILO) to update ISCO-88. The update is to be completed by late 2007 to allow sufficient time for the new classification (ISCO-08) to be used in the round of national population censuses to be conducted from 2010 onwards

6 In an exploratory questionnaire on updating ISCO that was sent to all countries towards the end of 2004, a question was included on the need for the coverage of occupations in Information and Communications Technology (ICT) to be updated and expanded. Not surprisingly, the need to provide more relevant and more detailed information about these occupations was among the highest priority issues identified in the responses to the questionnaire.

Overview of the conceptual model to be used for ISCO-08

7 ISCO-08 will be an update rather than a major revision of ISCO-88. The concepts of skill level and skill specialisation will continue to be used to group occupations together.

8 Skill level is defined as a function of the complexity and range of tasks and duties to be performed in an occupation. Skill level will be measured operationally in ISCO-88 by considering one or more of:

- the nature of the work performed in an occupation in relation to the characteristic tasks and duties defined for each ISCO-88 skill level;
- the level of formal education defined in terms of the International Standard Classification of Education (ISCED-97) required for competent performance of the tasks and duties involved;
- the amount of informal on-the-job training and /or previous experience in a related occupation required for competent performance of these tasks and duties.

9 Skill specialisation is defined as a function of four factors:

- the field of knowledge required
- the tools and machinery used
- the materials worked on or with: and
- the kinds of goods and services produced.

10 The concept of skill level is applied mainly at the top (major group) level of the classification. This means that, in general, each major group in ISCO-08 will contain occupations only at one of four skill levels. For example, ISCO Major Group

2, Professionals should only include occupations at the highest ISCO skill level, Skill Level 4. The four skill levels defined for ISCO-08 are described in Annexe 1 of the second questionnaire on updating ISCO-88 which can be found here: <http://www.ilo.org/public/english/bureau/stat/isco/isco88/quest.htm>.

11 Within each major group occupations are arranged into unit groups, minor groups and sub-major groups, primarily on the basis of aspects of skill specialisation. It is anticipated that there will be between four and five hundred unit groups at the most detailed level of ISCO-08 and that the ten major groups ISCO-88 will not be changed.

Policy and data problems with ICT occupations

12 The ICT labour market has been characterised over the last 20 years by a rapid rate of occupational change and rapid employment growth. The rapid growth in employment, in terms of total numbers employed and total numbers of job vacancies, is in part a reflection of the increasing dominance of ICT in the global economy. The rate of occupational change has been driven by the frequent emergence of new technologies requiring new skills and new ways of working.

13 A result of this rapid growth and rapid change has been the existence of serious skill shortages in ICT most of the time. The ICT labour market has also been characterised, however, by short episodes of over supply in some areas due to fluctuations in the business cycle.

14 There are two different aspects to the ICT skills needed by a modern work force. The first relates to the need for ICT skills by the users of ICT products and services. The second relates to those skills required for the production of goods and services in ICT.

15 The need for ICT skills among the general workforce varies significantly from one job to another and is also changing rapidly over time. Until recently, for example, nursing professionals had little requirement for general skills in the use of information technology, although they frequently needed skills in technology specific to the health field. Increasingly however, nurses are required to exchange patient and diagnostic information electronically within and between hospitals.

16 Since the rate of change in demand for these general ICT skills is so rapid, it is possible to address these issues in ISCO only in those exceptional cases where technological developments have led to new ways of organising work. The most notable example is in the emergence of customer contact centres (call centres) and of new occupations for those employed in these centres.

17 For the second dimension of the problem, relating to the skills required for the production of goods and services directly in ICT, ISCO has a major role in providing a framework for the consistent description of the ICT labour market. This is an area where ISCO-88 can be seen to be badly out of date. For example occupations such as Website Developer and Web Administrator are not separately identified in ISCO-88 and have been dealt with differently by users of the classification in different countries and contexts.

18 The absence of a common terminology or common understanding of occupational structures within the industry has made these problems worse. For example, the job titles and occupational descriptions used by one company in job advertisements might be quite different from those used by another company.

Occupations in ISCO which produce ICT goods and services

19 The dominant use of skill level in ISCO means that occupations unique to the production of goods and services in ICT can be found in several major groups. These include Managers, Professionals, and Technicians and associate professionals and Craft and related trades workers. The differentiation of ICT occupations according to skill level has proved to be problematical in a number of cases, especially where it is necessary to distinguish between occupations in ISCO Major group 2, Professionals (Skill level 4) and Major group 3, Technicians and associate professionals.

20 A listing of ISCO-88 groups that are explicitly intended for occupations related to ICT is provided below in Table 1.

TABLE 1
ICT specific groups in ISCO-88

12 CORPORATE MANAGERS

123 Other department managers

1236 Computing services department managers

21 PHYSICAL, MATHEMATICAL AND ENGINEERING SCIENCE PROFESSIONALS

213 Computing professionals

2131 Computer systems designers and analysts

2132 Computer programmers

2139 Computing professionals not elsewhere classified

31 PHYSICAL AND ENGINEERING SCIENCE ASSOCIATE PROFESSIONAL

312 Computer Associate Professionals

3121 Computer assistants

3122 Computer equipment operators

3123 Industrial robot controllers

21 A number of other groups in ISCO-88 also include occupations that are related to ICT. Most notably Minor Group 724, Electrical and Electronic Equipment Mechanics and Fitters contains unit groups for Electronics Fitters, Electronics mechanics and servicers, Telegraph and telephone installers and servicers and for Electrical line installers, repairers and cable jointers. Managers of ICT service

companies would be included in Unit Group 1319, General managers not elsewhere classified and ICT trainers in Unit Group 2359, Other teaching professionals not elsewhere classified.

22 Following analysis of the questions on ICT occupations in the questionnaire on updating ISCO sent to all countries in late 2004, a revised proposal was discussed by the UN Expert Group on International Economic and Social Classifications and by the ILO Technical Expert Group for Updating ISCO.

23 These groups of experts identified a number of issues that needed to be resolved before the approach to be taken could be finalised. Their concerns related in particular to skill level for applications and software programmers, to the need to address the convergence between information and communications technology, and to the distinction between hardware engineers and software engineers.

24 It was agreed that the ILO should prepare updated proposals on occupations in information and communication technology, based on the discussion held, and submit them to relevant stakeholders for consultation and advice. There was particular concern to ensure that occupations in telecommunications were adequately covered.

25 The groups listed in Table 2 are proposed as a starting point for discussion. Once there is agreement on the framework, the ILO will consult with industry on definitions of each group and on the detailed occupational titles to be listed with each group. In addition, options are being considered for the separate identification of ICT sales occupations.

Thematic grouping for ICT

26 In order to satisfy the demand for internationally comparable information on occupations from an industry perspective, a system of thematic groupings (or alternative views) will be developed to complement the main structure of ISCO-08. The ICT thematic grouping in ISCO-08 will allow all of the unit groups comprising occupations that directly provide ICT goods or services to be aggregated in a consistent and standard way. It is hoped that this approach will serve to address problems currently experienced by users of data who require nationally or internationally comparable information on the ICT work force.

27 Jobs that require the use of ICT as a tool only, even if this is at quite a high level, will be excluded from the ICT thematic grouping. Similarly, occupations that do not require specific skills in the production of ICT goods and services (for example, Accounting clerks, Secretaries, Industrial robot operators, Electronic equipment assemblers) will be excluded from the ICT alternative even when they relate to employment in enterprises that produce ICT goods and services.

28 The unit groups (4-digit categories) listed in Table 2 would provide the basis for the ICT thematic grouping.

TABLE 2
Proposed sub-major, minor and unit groups containing ICT occupations
in ISCO-08

13	Production and operations managers
....	
133	Information and communications technology services managers
1330	Information and communications technology services managers
23	Teaching professionals
....	
235	Other Teaching professionals
....	
2356	Information technology trainers
25	Information and communications technology (ICT) professionals
251	Software and multimedia developers and analysts
2511	Systems analysts
2512	Software developers
2513	Web and multimedia developers
2519	Software and multimedia developers and analysts not elsewhere classified
252	Database specialists and systems administrators
2521	Database designers and administrators
2522	Systems administrators
253	ICT network and hardware professionals
2531	Computer network professionals
2532	Telecommunications engineering professionals
2529	ICT network and hardware professionals not elsewhere classified
35	Information and communications technicians
351	ICT operations and user support technicians
3511	ICT operations technicians
3512	ICT user support technicians
352	Web technicians
3520	Web technicians
353	Applications development and testing technicians
3531	Applications programmers
3532	Systems testing technicians
354	Communications Technicians
3541	Broadcasting and recording technicians
3542	Telecommunications engineering technicians
74	Electrotechnology trades workers
....	
742	Electronics and telecommunications installers and repairers
7421	Electronics fitters
7422	Electronics mechanics and servicers
7423	Information and communications technology installers and servicers

Issues for consideration and discussion

29 Before the ISCO-08 structure can be finalised, the approach to be taken towards the classification of ICT occupations needs to be seen to be acceptable both to key users and to industry itself. To assist the process of consultation the views of stakeholders are requested on the following issues:

- 1 **Is the overall approach outlined in Table 2 appropriate and useful?**
- 2 ISCO is not intended to provide the level of detail required by business for detailed job placement activities and personnel inventories. It aims, however, to provide an organising and integrating framework for these purposes and for the presentation of statistical data. **Is the level of detail provided for ICT occupations suitable for the intended purpose?**
- 3 Minor group 251 is intended to deal primarily with development of software while Minor group 253 is focussed on those who specialise in networking, communications and hardware. Minor group 252 is intended to focus on the increasingly important areas of systems and database administration, including IT security specialists. Database analysts and designers are also included in this group as it is not seen to be appropriate to classify them separately from database administrators. **Are there any problems with the creation of a minor group for database specialists and systems administrators? Is it preferable to group database specialists in the same minor group as software developers and systems administrators in the same minor group as network administrators?**
- 4 A widespread criticism of ISCO-88 is that all computer programmers are classified in Major group 2 Professionals. It is suggested that there are many programming jobs that are not at the required level of skill for this group (ie that do not require a level of skill equivalent to a 3 or 4 year university degree). The problem is to find a feasible way of distinguishing between the different types of programmer in responses to questions in censuses and surveys. The solution proposed is to classify those programmers who are involved in developing software in Unit group 2512 Software developers. Those who use or adapt software products to meet specific business needs would be classified in Unit group 3531, Applications programmers. Someone whose occupation was described as 'Programmer' would, in the absence of further information, be classified as an applications programmer. **Is it appropriate and feasible to classify applications and software programmers in separate major groups?**
- 5 Unit Group 3532, Systems testing technicians is based on an approach used in some countries. It includes occupations like user acceptance tester as well as those involved in testing telecommunications systems and equipment. **Is it useful or appropriate to create a unit group for systems testing technicians?**

6 Attempts have been made to reflect the growing convergence between information and telecommunications technologies by:

- including unit groups that are specific to telecommunications (including broadcasting) in the same minor groups as other occupations in ICT; and
- creating some unit groups that cover both information and telecommunications technologies where there appears to be real convergence in the skills required in the labour market (Unit group 7423, ICT installers and servicers is one such example).

Is the approach taken towards the convergence between IT and telecommunications occupations useful? Is there a need for more or less detail with respect to occupations that deal mainly with communications technology?

