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**Options and Possibilities for the Future Revision of the International Standard
Classification of Occupations, 2008 (ISCO-08)**

David Hunter, ILO



Department of Statistics

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Classifications

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**Options and possibilities for the future
revision of the International Standard
Classification of Occupations, 2008
(ISCO-08) ¹**

¹ Prepared by David Hunter, Senior Statistician, ILO Department of Statistics.

Abbreviations

ICLS	International Conference of Labour Statisticians
ICSE	International Classification of Status in Employment
ICT	Information and Communications Technology
ILO	International Labour Organization
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISCO-08	International Standard Classification of Occupations, 2008
ISCO-88	International Standard Classification of Occupations, 1988
ISIC	International Standard Industrial Classification of All Economic Activities
LFS	Labour Force Survey
OECD	Organisation for Economic Co-operation and Development
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organisation
WRL	World Reference Levels

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1. Introduction and Background

1. The current version of the International Standard Classification of Occupations (ISCO) was adopted through a resolution of a tripartite Meeting of Experts on Labour Statistics in December 2007, and subsequently endorsed by the ILO Governing Body in March 2008. Accordingly it is known as ISCO-08. Its adoption by a meeting of experts was mandated, exceptionally, by a resolution of the 17th International Conference of Labour Statisticians (ICLS).
2. The main purposes of ISCO-08 are to provide:
 - (a) A basis for the international reporting, comparison and exchange of statistical and administrative information about occupations;
 - (b) A model for the development of national and regional classifications of occupations;
 - (c) A system that can be used directly in countries that have not developed their own national classifications.
3. In line with the recommendations of the Expert Group with respect to the main international reference classifications, that the relevant governing authority should consider at least every five years, a review outlining the case for a revision, update or no change,² the ILO presented a paper on the case to update or revise ISCO-08 to the 19th ICLS in October 2013.
4. The Expert Group envisages two possible types of change to international classifications: the *revision* and the *update*. A *revision* implies major changes that would entail one or more of the following:
 - (a) Renumbering of all or a substantial portion of the classification structure;
 - (b) Restructuring and regrouping a substantial portion of the classification;
 - (c) New concepts for defining groups at one or more levels of the classification hierarchy (such as the application of a consistent concept throughout the classification).
5. An *update* implies a more limited set of changes. The types of change envisaged in an update are:
 - (a) Addition or removal of a category at the most detailed level of the classification within the existing structure;
 - (b) Realignment of the content of categories (e.g., one occupation moves from one unit group to another in ISCO);
 - (c) Multiple categories are added or removed from the most detailed level of the classification but the basic structure remains substantially unchanged.³

² UN, 2011

³ Murphy, J and Franco, A

6. Many countries have now adapted national occupation classifications to improve comparability with ISCO-08, have developed national classifications based on ISCO-08, or have developed correspondence tables that will allow them to report data according to ISCO-08. ISCO-08 has been used in all relevant European Union collections from 2011 onwards.
7. Feedback on the usefulness of the classification has generally been positive. There are several cases, however, where more detail has been requested, or where it is felt that the treatment of particular occupational groups is inadequate. In addition there are concerns that the way in which the concept of skill level was applied to the design of both ISCO-88 and ISCO-08 imposes limitations on the usefulness of ISCO for the purposes of analysing and measuring things like the oversupply and undersupply of skilled workers.

Discussion at the 19th ICLS

8. The ILO presented a paper to the 19th ICLS which summarized the issues that could justify work to update or revise ISCO-08, in order to assist the 19th ICLS in determining whether or not there was a need undertake a minor update of ISCO-08 in the short term, or to start planning for a longer term revision to be completed after the 20th ICLS. Some of the issues could only be addressed in the context of a full revision of ISCO-08, whereas others could be addressed as part of a more limited update. This paper proposed two options for the update or revision of ISCO-08.
 - i. A minor update could be undertaken and completed in a period of one to two years. Changes would be restricted to the addition or deletion of categories at the unit group level, or the movement of some occupations from one unit group to another. This would require mandate from the 19th ICLS for the updated classification (effectively ISCO-08 version 2) to be adopted by a tripartite meeting of experts in 2015. The need for a full review could then be considered by the 20th ICLS in 2018.
 - ii. A wider review conducted over a longer timeframe, and allowing more significant structural changes to be considered, could be completed after the 20th ICLS. Work to evaluate ISCO-08 and further develop proposals for revision could continue in preparation for the 20th ICLS with a view to presenting one or more options for conclusion of the work.
9. During the discussion of ISCO at the 19th ICLS there was a wide range of views on the relevance, timeframe and frequency of an eventual revision or update. Some delegates were in favour of an update in the short term in order to reflect economic and technological changes that had taken place over the last five years. They also saw the need, however, to consider broader issues such as those related to skill level, skills underutilization, business structures, and the identification of occupations associated with green jobs. All of these implied the need for a longer term review. Many delegates felt that there had not been enough time to accumulate the experience in using ISCO-08 needed to make a deep revision, and that the costs of making changes (in terms of resources and breaks in series) were too high to justify frequent revisions. Some delegates were not yet in a position to adopt ISCO-08 and were still using earlier versions.
10. It was stressed that the revision or update of a national classification in line with a revised or updated ISCO was a long and complex process that required the involvement of a great number of partners, institutions and agencies. There was concern that minor changes tended to end up being more significant than expected. Some felt that it was too early for any kind of change,

regardless of how minor, and that any change would cause comparability issues. The need to include regional aspects of occupational patterns and for regional consultations was also raised.

11. Some delegates stressed the importance of having the tools necessary to implement an international classification, such as the relevant publications and manuals, as well as translations soon after the classification is launched. Several delegates pointed to the need for manuals and guidelines on updating national classifications, correspondence tables or mapping procedures between classification versions.
12. While there was not a strong consensus on the need for a short-term update, there was also concern about the timing of a deeper revision in relation to the 2020 round of censuses. Starting the preparatory work for a revision of ISCO-08 only after the 20th ICLS might mean that few countries would be able to implement the new classification until the 2030 round. It was suggested that a useful approach might be for the ILO to establish a technical group and/or a knowledge-sharing platform to reflect the lessons learned in the implementation of ISCO-08 in order to identify common issues and document the improvements needed. A more thoroughly considered set of options for revision could then be developed in advance of the 20th ICLS.

2015 Meeting of the Expert Group

13. The ILO presented a paper to the 2015 meeting of the Expert Group which discussed the issues that might be addressed in any work to revise ISCO. It was noted that the issues around skill level discussed in the ILO paper were becoming problematic, and that several countries would be undertaking revision work on their national classifications in the coming few years. This work could potentially feed into the ILO's proposals for a revision.
14. It was decided that the Expert Group would recommend that a technical working group be established to assist the ILO to determine an approach for the revision ISCO and support the ILO with the work. The Expert Group asked to be informed on progress at its next meeting

The case for a revision or update of ISCO-08

15. Several of the issues previously raised on the need of a revision of ISCO-08 were concerned with the measurement of skill level and would require a significant change in the application of the ISCO conceptual model to the design of the classification, although the key underlying concepts would not need to change. They could therefore only be addressed in the context of a major revision of ISCO-08.
16. There are more recent developments that impact on the relevance of reviewing the application of skill level as a classification criterion in ISCO. These include further ILO work on the statistical measurement of mismatches between occupations and qualifications, as well as various policy-driven initiatives concerning skills mismatch. They also include work that has been undertaken in response to the invitation to UNESCO, in the 2012 Shanghai Consensus on technical and vocational education and training (TVET),⁴ “to identify a set of world reference

⁴ Shanghai Consensus: Recommendations of the Third International Congress on Technical and Vocational Education and Training ‘Transforming TVET: Building skills for work and life’, Shanghai,

levels, to facilitate the international comparison and recognition of TVET qualifications". These developments are described briefly in the discussion below but further investigation would be required to fully assess potential consequences for ISCO.

17. The remaining issues that were raised in the reports to the 19th ICLS and the Expert Group, could potentially have been addressed as part of a minor update. They would mainly involve splitting or merging some unit groups and/or the movement of numerically relatively small occupations between aggregate groups. The optimal solution for some of the issues identified, however, would involve changes such as the creation of a new minor group that might go slightly beyond the three types of change envisaged by the Expert Group as part of an update. Some of the issues that have recently been raised concerning emerging or changed occupations and information needs, would also suggest the need for more significant restructuring in some parts of the classification.
18. The known issues that would need to be addressed in a review or update of ISCO are summarised below, including the issues that were reported at the 2015 Expert Group meeting and issues that have emerged since that time. Chapter 2 covers issues that would require a full review of ISCO. Chapter 3 discusses the issues could be potentially addressed in the context of a minor update or light review of ISCO-08.
19. The ILO has not yet been in a position to establish technical group or knowledge-sharing platform due to resource limitations. It is proposed, however to engage a consultant to assist the ILO in researching and describing the issues that need to be addressed and in developing the options for revision, in advance of the 20th ICLS which will take place in October 2008.

People's Republic of China, 14 to 16 May 2012:

<http://www.unesco.org/fileadmin/MULTIMEDIA/HQ/ED/pdf/concensus-en.pdf>

2. Issues that could only be addressed in a full review of ISCO

Use of ISCO for the measurement of skills mismatch

20. In 2008, the 18th ICLS discussed the use of skills mismatch as a potential indicator or component of the measurement of labour underutilization. The concept of skills mismatch was seen in this context as a measure of persons whose skills were underutilized, defined as persons whose educational level exceeded the skill level required by their current job.⁵ Since the term 'skills-mismatch' could refer both to the oversupply and to the undersupply of workers with suitable skills, the term 'skills underutilization' has been used in subsequent papers discussing this issue. Educational level and skill level are frequently considered in international studies in terms of the International Standard Classification of Education (ISCED) and ISCO respectively.⁶
21. The need for an internationally harmonized method for the measurement of skills underutilization and skill mismatch in the broader sense remains a high priority that was emphasised during the 19th ICLS. Measurement is needed both as an indicator of labour underutilization and to support analysis of problems of supply and demand of skilled labour. Any work to review or update ISCO-08 would therefore need to take into consideration the suitability of the classification for the measurement of skills underutilization.
22. Skills mismatch based on educational level and skill level is sometimes referred to as 'vertical mismatch' and results in concepts of over-education and under-education. Equally, there are concerns about horizontal skills mismatch: the extent to which workers are employed in an occupation that is unrelated to their principal field of study⁷. These latter concerns are primarily related to the use of skill specialization as a classification criterion in ISCO, which has not been identified as particularly problematical.
23. One aspect of skills mismatch is related to shortages of skilled workers. Analysis of skill shortages is concerned with the number of workers who are not adequately qualified for the jobs in which they are employed, and with the number of job vacancies that cannot be filled due to the lack of appropriately qualified persons. Typically this requires information on both vertical and horizontal skills mismatch. At the macroeconomic level labour economists are concerned with potential bottlenecks that impose limitations on national capacities for economic development due to the unavailability of a suitably skilled and educated population.
24. Recent academic research as well ILO work to develop guidelines for the measurement of qualification and skill mismatch have identified both under-qualification and over-qualification as significant problems in many countries⁸. The extent of mismatch measured, however, is highly sensitive to the analytical methods used. All methods would appear to overestimate the

⁵ ILO. 2008.

⁶ See also Sengenberger, W and 18th ICLS Room document no 13.

⁷ See McGuinness, Pouliakas and Redmond,

⁸ See for example: http://www.ilo.org/skills/pubs/WCMS_554348/lang--en/index.htm

levels of both over-qualification and under-qualification while nevertheless producing interesting and informative results.⁹

25. Some experts in occupation classification have pointed out that measuring skills mismatch is inherently difficult. It raises a number of problems beyond the need for data at a more detailed level, especially the need to determine who is overqualified for a certain position. Moreover, the basis for defining skill level lies in the nature of the tasks performed in relation to characteristic tasks defined for each skill level. There is not always strong link between the occupational skills required and the formal educational level of the job holder.

Problems with ISCO skill levels

26. Whilst it could be argued based on the discussion above that further refinement of the four skill levels for use in studies on skills mismatch may be difficult to achieve, there are some specific issues about the application of skill level in both ISCO-88 and ISCO-08 that go beyond the utility of the classification for analysis of skills mismatch. These issues may impact on the use of data classified by ISCO for a range of analytical beyond skills mismatch, as well as impeding its utility for the analysis of skills mismatch. These issues may be summarized as:

- (a) The excessive breadth of Skill level 2, including its boundary with Skill level 1
- (b) The boundary between Skill levels 2 and 3

Breadth of Skill level 2

27. The major groups in ISCO-08 are defined in terms of four broad skill levels as shown in Table 1. A significant issue derives from the breadth of one of these skill levels - Skill Level 2. According to the ISCO-08 Introductory and Methodological Notes:

The knowledge and skills required for competent performance in occupations at Skill Level 2 are generally obtained through completion of the first stage of secondary education (ISCED-97 Level 2). Some occupations require the completion of the second stage of secondary education (ISCED-97 Level 3), which may include a significant component of specialized vocational education and on-the-job training. Some occupations require completion of vocation-specific education undertaken after completion of secondary education (ISCED-97 Level 4).¹⁰

28. As a result, the distinction between occupations that require completion of extensive vocational education and training, and those that require a short period of training plus basic literacy and numeracy is not made systematically. Occupations in Major groups 4 – 8 are all considered to be at Skill Level 2, as shown in Table 1 below.

⁹ The results of this work have not yet been published but will be made available in advance of the 20th ICLS.

¹⁰ ILO 2012

Table 1 Mapping of ISCO-08 major groups to skill levels

ISCO-08 major groups	Skill level
1 Managers	3 + 4
2 Professionals	4
3 Technicians and Associate Professionals	3
4 Clerical Support Workers 5 Services and Sales Workers 6 Skilled Agricultural, Forestry and Fishery Workers 7 Craft and Related Trades Workers 8 Plant and Machine Operators, and Assemblers	2
9 Elementary Occupations	1
0 Armed Forces Occupations	1 + 2 + 4

29. Occupations that vary significantly in skill level but are similar in skill specialization, are frequently grouped together, sometimes at the most detailed level of the classification. This limits the usefulness of the classification for analysis of skill level requirements, of skill mismatch, of income as a return to education, of educational planning and for the measurement of socio-economic status. From a theoretical classification perspective it may be seen as resulting in categories that are excessively heterogeneous in terms of skill level. The problems with home improvements installers and vehicle accessory fitters discussed below are a reflection of this problem.

Boundary between Skill Levels 2 and 3

30. Some experts have reported that there are problems with the boundary in skill level between some of the more skilled technical occupations classified at Skill Level 2, and occupations at Skill Level 3 included in Major Group 3, Technicians and Associate Professionals. This refers primarily to some of the more technical occupations in Major Group 7, Craft and Related Trades Workers, where technological changes are leading to higher knowledge and skill requirements. Occupations concerned with vehicle and aircraft maintenance or electrical, electronics and telecommunications installation and maintenance are good examples.

Possible approaches to address problems with the application of skill level as a classification criterion

31. The ILO paper on ISCO at the 19th ICLS identified four possible approaches that could be taken to address the limitations of ISCO-08 arising from the way in which the concept of skill level has been applied to the design of the classification. None of these approaches would require a fundamental change to the conceptual underpinnings of the classification. All would lead to significant structural changes, however, including at the top level of the classification. These four approaches are summarised below.

Option 1 - Moving the boundary between Skill levels 1 and 2

32. The first approach would involve moving the boundary between Skill levels 1 and 2 so that basic clerical support occupations, sales assistants, accessory installers and most plant and machine operators and drivers would be classified at Skill level 1. Some of these occupations would be moved to Major Group 9, and some to Major Group 8. The more skilled occupations in the current Major group 8 would have to be moved to Major group 7. All occupations in the new Major group 8 would be associated with the new Skill level 1. The names of each major group would not necessarily need to change significantly, but the contents of Major Groups 4 to 9 would be radically different.

Option 2- Application of five skill levels at unit group level.

33. The second approach would involve the application of five (instead of four) skill levels at unit group level. This could be achieved by splitting the current Skill level 2 without changing the boundaries with other skill levels. Each unit group in Major groups 4, 5, 6, 7 and 8 could then be associated with a single skill level, within the framework of the current major and minor group structure. Some unit groups would have to be split, in the same way as we propose below for vehicle accessory fitters.
34. This option would mean either that analysis related to skill mismatch would need to be based on data at unit group level, or that standard aggregate statistical outputs would include tabulation by occupational skill level as well as by occupational major groups. Whilst this may be seen as a disadvantage, the approach has the advantage that the major group structure, which is currently well accepted, would not need to change significantly.

Option 3: Application of five skill levels at major group level

35. The third option would also involve the creation of five skill levels as described above. In this case the skill level distinction would be applied primarily at major group level, so that data on skill level could be compiled on the basis of aggregate statistics. The occupations currently classified in Major groups 4 and 5 would be allocated to major groups according to skill level instead of skill specialization, perhaps resulting in major groups for 'skilled clerical, services and sales workers' and for 'clerical, sales services and support workers'. As with the second option the more skilled occupations in Major group 8 would have to be moved to the the equivalent Major Group 7 and the less skilled occupations in Major Group 7 would be moved to Major Group 8 or 9. If this option were adopted, the revised major group structure might be as shown in Table 2.

Table 1 Potential ISCO-08 major groups and skill levels with application of five skill levels primarily at major group level

Revised ISCO major groups	Skill level
1 Managers	4 + 5
2 Professionals	5
3 Technicians and Associate Professionals	4
4 Craft and Related Trades Workers 5 Skilled Agricultural, Forestry and Fishery Workers 6 Skilled Clerical, Services and Sales Workers	3
7 Clerical, Services, and Sales Support Workers 8 Plant and Machine Operators, and Assemblers	2
9 Elementary Occupations	1
0 Armed Forces Occupations	?

Option 4: Moving the boundary between Skill Levels 2 and 3

36. The fourth option would involve moving the boundary between Skill Levels 2 and 3 so that the more highly skilled occupations within the current Skill Level 2 would be classified at the new Skill Level 3. For example some of the occupations that typically require extensive vocation-specific training after the completion of secondary education might be classified at Skill Level 3. The main result of this would be that some occupational groups would be moved from Major Group 7 to Major Group 3. Some occupations in Major Groups 4 and 5 could also be affected. The movement in the boundary between Skill Levels 2 and 3 could be undertaken either independently of other changes or in combination with one of the other three options discussed above.

World Reference levels

37. The initiative led by UNESCO to identify a set of world reference levels (WRL), to facilitate the international comparison and recognition of TVET qualifications may present interesting opportunities to improve the definition of skill levels in any future revision of ISCO. The WRLs aim to provide a global means of comparing qualifications and also have a broader utility – being applicable not only to TVET qualifications, but also to other kinds of qualification, requirements for admission or recruitment, occupational standards, and other forms of outcomes-based specifications. In principle, the WRLs should allow individuals and organisations to:

- make comparisons between, and negotiate recognition among, the growing number of local, sectoral, occupational, national and regional qualification frameworks;
- convert the levels of competency frameworks, job requirements/person specifications, entry requirements/recommended entry for courses of study, or the outcomes of learning programmes, into internationally agreed terms

- create outcomes-based occupational management or career structures which can be applied internationally
- provide a basis for pegging validated formal, non-formal and informal learning to globally understood levels and encompass a wide range of flexible learning paths, opportunities and techniques.¹¹

38. Since the WRLs will in principle be linked not only to formal qualifications but also to information about informal learning, they may provide a good basis to improve the operational measurement of skill level in a revised ISCO, either instead of or in conjunction with the ISCED levels of education. The current draft WRL proposals identify 4 ‘stages’, each broken down into 2 ‘phases’. Some of the boundaries between the WRL stages appear to align with the ISCO Skill level boundaries, whereas in other cases, it is the lower level boundaries between phases that are aligned with the ISCO boundaries. This could present the opportunity to move ISCO skill level boundaries, or create an additional skill level, while retaining linkage to an established international framework for the measurement of skills and competencies.

¹¹ Hart, John

3 Issues that could potentially be addressed in the context of a minor update of ISCO-08

39. A number of issues related to emerging or new occupations, changes in the skill content of occupations and emerging analytical needs could be addressed in the context of a minor update or light review of ISCO-08, involving the addition or merging of some unit groups, movement of some occupations between major groups and a small amount of change at minor group and sub-major group levels. Some of these issues might be better dealt with, however, in the context of a more thorough revision. The known issues are summarized below.

Hospitality and retail managers

40. There is concern that Minor Group 141, Hotel and Restaurant Managers and Minor Group 142, Retail and Wholesale Trade Managers, are too heterogeneous in terms of skill level. The managers of large establishments with hierarchies of managers, as well as the managers of relatively small retail and hospitality businesses are classified in the same group. Since occupation titles such as ‘Hotel Manager’ and ‘Shop Manager’ may frequently be used to describe both groups, it is difficult to find an easy solution to this problem but there is a need for further investigation of the options. Under Options 3 and 4, the remainder of Sub-major group 14, Hospitality, Retail and Other Services Managers could potentially be moved out of Major Group 1.

Supervisors

41. ISCO-08 includes six unit groups for supervisory occupations in specific sectors where supervisors do not mainly perform the same tasks as the workers they supervise. All other supervisory occupations are classified in the same unit group as the most skilled occupation supervised. Some experts consider that there is a need for additional supervisory unit groups, especially in the services sector.

Company secretaries and corporate governance specialists

42. The Institute of Chartered Secretaries and Administrators has suggested the need for a separate category for chartered or company secretaries and corporate governance professionals. Company secretaries are currently classified in Unit Group 1211, Finance Managers. A number of commentators have observed that this treatment may be problematical. If there is a need for a separate category, the potential options would appear to create an additional unit group either in Minor Group 121, Business Services and Administration Managers, or in Minor Group 242, Administration Professionals. Since some countries have reported that the numbers employed in these occupations are relatively small, it may be difficult to justify the creation of a separate unit group, however.

Health Occupations

43. A significant number of requests have been made by relevant professional associations and also by the World Health Organization (WHO) to make adjustments to the ISCO structure and create additional unit groups in relation to occupations concerned with health care. These requests are submitted in the context of the need to improve the quality and international comparability of

data on the health work force, and are related to significant ongoing policy concerns about the supply of and demand for suitably qualified workers in a wide range of occupational groups. In addition there are specific types of analysis related to health workers that could benefit from adjustments to the ISCO structure, for example to improve the quality of statistics on competent attendance in maternal and newborn health.

Medical practitioners (Unit group 2212)

44. Some users have identified a further breakdown of specialist medical practitioners by specialty. This could be achieved by splitting unit group 2212 into several groups in line with current practice in the adaptation of ISCO-08 used in the WHO/OECD/Eurostat health work force collection.¹² The groups of specialist medical practitioners separately identified in this collection are:

- General paediatricians
- Obstetricians and gynaecologists
- Psychiatrists
- Medical group of specialists
- Surgical group of specialists
- Other specialists not elsewhere classified.

45. The content of each of the above groups has already been defined. There have also been demands for the separate identification of Family medical practitioners with specialist training. If changes along these lines were incorporated in a revised ISCO, the current Unit group 221 Medical Practitioners could look like this.

- 2211 General Medical Practitioners
- 2212 Family Medical Practitioners
- 2213 General paediatricians
- 2214 Obstetricians and gynaecologists
- 2215 Psychiatrists
- 2216 Medical specialists
- 2217 Surgical specialists
- 2219 Other specialists not elsewhere classified.

Oral and maxillofacial surgeons

46. Representatives of oral and maxillofacial surgeons in Europe are dissatisfied with their inclusion in Unit Group 2261 Dentists. This is inconsistent with EU regulation which recognizes them as medical specialists. In North America and many other regions they are grouped with dental practitioners. Several ways to resolve this problem could be envisaged. These could include: (1) separate identification within minor group 221 Medical Doctors; (2) renaming of unit group 2261 to reflect the inclusion of oral and maxillofacial surgeons ; (3) creation of a new minor group of Dental and Related Medical Specialists including a separate unit group for oral and maxillofacial surgeons, possibly including some other specialised dental occupations; (4)

¹² OECD 2012

inclusion of the group without separate identification in Unit group 2212, Specialist Medical Practitioners; or (5) separate identification within Minor group 226 other Health Professionals.

Medical technologists and therapists

47. There has been strong representation from the Pan-American Association of Medical Technologists that the inclusion of some medical technologists in minor group 321 Medical and Pharmaceutical Technicians does not reflect their skill level. Depending on the discipline, some medical technologists are currently classified in Minor Group 226, Other Health Professionals.
48. There have been related requests for the separate identification in Major Group 2 of occupations concerned with technology for medical diagnosis and therapy, including radiographers, radiotherapists, prosthetists and orthotists. These occupations are currently classified in Minor Group 321 Medical and Pharmaceutical Technicians and the requests to move them to Major Group 2 appear to be well justified based on current educational requirements and the changing nature of the work performed. There is general concern about the relative invisibility in health work force statistics of occupations concerned with medical technology.
49. In addition there have been requests for the separate identification of occupational therapists, who are currently included in Unit Group 2269 Health Professionals Not Elsewhere Classified.
50. Further investigations and the consideration of practices in recently reviewed national and regional classification would be required before any definitive proposals could be put forward. The movement of several health occupations from Major Group 3 to Major Group 2, however, would most likely best be achieved by creating an additional minor group in Sub-Major Group 22, Health Professionals. A possible solution could be that the last 2 minor groups in this sub-major group might be structured as follows:

226 Medical Technologists

- 2261 Radiographers and Radiotherapists
- 2262 Medical and Pathology Laboratory Technologists
- 2264 Optometrists and Ophthalmic Opticians
- 2266 Prosthetists and Orthotists
- 2269 Other Medical Technologists

227 Other Health Therapy Professionals

- 2271 Dentists
- 2272 Pharmacists
- 2273 Environmental and Occupational Health and Hygiene Professionals
- 2274 Physiotherapists
- 2275 Dieticians and Nutritionists
- 2276 Audiologists and Speech Therapists
- 2277 Occupational Therapists
- 2279 Other Health Therapy Professionals Not Elsewhere Classified

51. Under this scenario, the structure of Minor Group 321, Medical and Pharmaceutical Technicians may not need to be significantly modified, although the scope of some of the unit groups would be reduced.

Biomedical engineers

52. Biomedical engineering is concerned with the design, development, and evaluation of biological and health systems and products, such as artificial organs, prostheses, instrumentation, medical information systems, and health management and care delivery systems. The case for separate identification of biomedical engineers and associated biomedical technicians requires further consideration.

Nurses and midwives

53. There has been some call for further disaggregation of nursing occupations to identify specialist nurses and advance practice nurses separately from general nurses. A further investigation of the possibilities should therefore be undertaken. Separate identification of traditional midwives from accredited midwives classified in Unit Group 3222 Midwifery Associate Professionals is required for the compilation of statistics on competent attendance in maternal and newborn health. Creation of a separate unit group for traditional midwives in Minor Group 322 Traditional and Complementary Medicine Associate Professionals could therefore be considered.

Paramedical practitioners

54. It is difficult to justify the continuing inclusion of emergency paramedics in Major Group 3 in the same unit group as ambulance officers, in view of their level of training and autonomy. Consideration should therefore be made to moving this occupation to Minor Group 224, Paramedical Practitioners. There is also a need to consider the separate identification of paramedical workers within Sub-major Group 224, such as those performing primary care, surgery and emergency care.

Information and communications technology (ICT)

ICT specialists and technicians

55. An updated and expanded set of categories was provided in ISCO-08 for occupations involved in the provision of goods and services in information and communications technology (ICT). These categories reflected the rapidly evolving occupational structures that emerged during the revolution in ICT that occurred during twenty years following the development of ISCO-88. There is concern, however, that the boundaries between some of the categories are blurred and that jobs may frequently be classifiable to several different groups, in a sector whose occupational structures and skill requirements remain fluid. Recent work on occupation classification systems at regional and national level also suggests the need for further significant revision of ICT occupations in ISCO.
56. There may, for example, be a need to determine whether an increasing number of jobs in ICT referred to as "architects" (enterprise architect, solutions architect, software architect, network architect, systems architect ...) are adequately covered by the existing unit groups or reflect new

or emerging occupations. The treatment of occupations such as data miner also requires further investigation.

Social media and on-line content

57. There may be a need to determine whether new social media occupations are emerging at the boundary between ICT and the world of marketing and advertising (Search engine optimization (SEO) specialist, SEO strategist, On-line community manager, On-line content moderator) or whether these are specializations of existing occupations.

E-commerce

58. Internet enabled commerce and increased levels of international trading is having a significant impact on the skill content of existing occupations in commerce and may be giving rise to the emergence of new occupations and job titles such as International Trade Technician, E-merchandiser, E-commerce shop assistant, Technical Specialist in e-commerce, E-commerce operator, and Expert in digital relationship management¹³. There is a need to evaluate the extent to which these developments may require the creation of one or more unit groups or revision of the scope and definitions of existing groups.

Conservator-restorers

59. A need to review the treatment of occupations related to conservation and restoration has been identified.

Financial and trade dealers and brokers

60. Securities and Finance Dealers and Brokers and as well Trade Brokers are currently classified in Major Group 3. In some national classification these occupations are classified in equivalent Groups to major group 2. On the one hand, it can be argued that the formal entry requirements for many of the entry level jobs in this group would be less than a university degree, and that the broking and trading aspects do not require advanced theoretical knowledge or problem solving. On the other hand many of the people employed in these jobs have university degrees or higher qualifications, the work requires high degrees of judgement, analytical and negotiation skills, and the level of earnings (as well as the risk of loss) would tend to suggest a high degree of skill and responsibility. There is a need therefore determine the appropriate skill level for these occupations.

Operators of small hospitality establishments

61. There is a possible need for the separate identification of operators of small bars, cafés and restaurants, who are currently classified as waiters, bartenders, cooks or chefs, depending on the main tasks or duties performed. A separate unit group could be created in Minor group 513, Bartenders and Waiters. Operators of small hotels, bed and breakfast establishments and guest houses are currently classified in Unit group 5152, Domestic Housekeepers. It is likely that the number of workers engaged in this type of activity is increasing due to the success of internet

¹³ *European Skills Council. 2014.*

applications such as Airbnb. It may be more appropriate to identify them as a separate unit group within the same minor group. Alternatively, the two new unit groups envisaged could be moved to form a new unit group for Operators of small hospitality establishments.

Subsistence Farmers, Fishers, Hunters and Gatherers

62. Sub-major group 63, Subsistence Farmers, Fishers, Hunters and Gatherers was created in the absence of any other international statistical instrument to allow measurement of subsistence activity. The resolution concerning statistics of work, employment and labour underutilization adopted by the 19th ICLS restricts the concept of employment to any activity to produce goods or provide services for pay or profit, and introduces two separate forms of work, namely own-use production work, volunteer work and unpaid trainee work.
63. Recognition of production of goods for own consumption as a separate form of work calls into question the need for ongoing identification of subsistence farmers, fishers, hunters and gatherers as a sub-major group in ISCO-08. A possible option would involve deleting Sub-major Group 63 and removing the restriction to market-oriented production of the remaining sub-major groups in Major Groups 6, Skilled Agricultural, Forestry and Fishery Workers. The ISCO groups would thus be used to classify jobs and work activities in all forms of work. The impact would be small for most countries as this group is not always used in national adaptations of ISCO.

Home improvements installers

64. Jobs that involve installation of things like blinds, curtains, awnings, prefabricated doors and windows currently have to be included either (1) with the closest trade occupation (for example door installers could be included in Unit Group 7115, Carpenters and Joiners), (2) in the residual Unit group 7119, Building Frame and Related Trades Workers Not Elsewhere Classified, or (3) in Unit Group 9313, Construction labourers. None of these options is satisfactory. Grouping of these jobs with specific trades is misleading as they do not perform the full range of tasks, although generally falling within the very broad Skill Level 2. Inclusion of these jobs in Unit Group 7119 is problematical as these workers are not concerned with building frames. Including them in Unit Group 9313 does not appropriately reflect their skill level.
65. Within the current skill level framework the problem could be resolved by the creation of either a specific unit group or a residual category in Minor group 712, Building Finishers and Related Trades Workers. A global resolution of the problem with the breadth of Skill Level 2, as discussed above, would offer more satisfactory options.

Vehicle accessory fitters

66. Occupations such as tyre fitter that do not require full trade qualifications have to be classified in Unit group 7231 Motor Vehicle Mechanics and Repairers. This is a similar problem to the one described above for home improvements installers. It could be resolved by the creation of a separate unit group in Minor group 723, Machinery Mechanics and Repairers. Some national classifications already provide a category for this group. For example, the United Kingdom Standard Occupational Classification has a category entitled 'Tyre, exhaust and windscreen

fitters'. As with home improvements installers, more satisfactory options would be available if the problem with the breadth of skill level 2 were resolved.

Operators of small boats

67. There is a possible a need to split Unit Group 8350 Ships' Deck Crew and Related Workers to separately identify operators of small boats from Ships' deck crew. Small boat operators include occupations such as Water taxi driver, Fishing charter boat driver and Dive boat driver. Workers who operate relatively small boats that would not require formal qualifications. Depending on the jurisdiction, licensing may be required as well as a 'small boat operator certificate' or similar. In Canada, for example, this involves a 26 hour course. A log providing evidence of time spent on the water may be required for commercial practice. They should not therefore be classified in Unit Group 3152, Ships' Deck Officers and Pilots
68. It may make sense to provide a separate occupation, to differentiate small boat operators from ship's deck hands, in view of the relevance of these occupations to tourism in many regions. Alternatively the description of Unit Group 8350 could be updated better reflect the inclusion of small boat operators.

Trades Assistants

69. Unskilled assistants to printers, mechanics, telecommunications technicians and electrical tradespersons are not adequately identified in ISCO-08. They are currently likely to be included either in Unit group 9329, Manufacturing Labourers Not Elsewhere Classified, or in Unit group 9629, Elementary Workers Not Elsewhere Classified. Depending on national practices, some of these occupations may currently be classified with the relevant trade or craft in Major group 7, however. The problem could be addressed by expanding the scope of Minor Group 932 Manufacturing Labourers and adding one or more new unit groups to that minor group. It would be important, however, to clearly distinguish between apprentices who should be classified according to the occupation they are training for but may frequently perform similar tasks to trades assistants, and those not undertaking the work as part of a training programme.

Armed forces

70. The scope of the Major Group 0, Armed Forces Occupations, was discussed during the development of ISCO-08 and remains problematical. There are different national practices with respect to the classification of occupations that are specific to the military and jobs in the armed forces that are similar to civilian jobs. In many countries, it is not possible to collect information on the nature of the work performed by members of the armed forces and all have to be classified together. In view of the significant variations in national practice there would be a need to re-open the discussion on the treatment of jobs in the armed forces in the context of a review of ISCO-08. For example, should Major Group 0 only include core military staff who perform typically military tasks, or also other jobs undertaken by members of the armed forces such as medical doctors, kitchen staff, truck drivers, human resource officers, operators of electronic military equipment; or should those occupations that have equivalents in civil life be classified together with the civilian equivalent, outside Major Group 0?

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