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The German Classification of Occupations 2010 – Structure, Coding and Conversion Table

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Abstract

The goal of developing a new German Classification of Occupations 2010 (KldB 2010) was to create an up-to-date and generally accepted classification of occupations for Germany which on the one hand satisfies the pronounced occupation-specific structuring of the German labour market and on the other hand enables linking to the International Standard Classification of Occupations 2008 (ISCO 08). In contrast to former German occupational classifications which were developed deductively based on existing expert knowledge about occupations, the KldB 2010 based on a theory-driven empirical analysis of similarities between occupations and a coherence check of these aggregation results.

In this methodological report, we first give a short introduction to the KldB 2010 as well as their systematic and structural innovations. Afterwards, we show how information on occupations (e.g. information on occupational activity gathered in an interview) can be coded according to the KldB 2010. Thereby, hints for the usage of the classification are provided, particularly in regard to rules of classification and assignment principles. Finally, we provide an overview of currently existing conversion tables from and to KldB 2010.

Keywords: KldB 2010. Classification of Occupations, coding of occupational activities, occupation conversion table

1 Necessity of a New German Classification of Occupations

The implementation of the Classification of Occupations in 2010 (KldB 2010) superseded the two national classifications of 1988 (KldB 88, Bundesanstalt für Arbeit 1988) and of 1992 (KldB 92, Statistisches Bundesamt 1992). Adaptation and standardisation of these classifications were not an option, particularly because they both could no longer map the current occupational pattern in Germany, and because, due to fundamental problems in the system, they were unsuitable for answering important empirical questions:

a) Lack of up-to-dateness of the occupational pattern mapped

Both the KldB 88 and the KldB 92 are essentially based on the Classification of Occupations developed in the seventies (Bundesanstalt für Arbeit 1970) and thus reflect the occupational pattern of the sixties.¹ They cover occupations in a very differentiated manner that have lost in significance since then, whereas occupations which are more strongly differentiated today are subsumed in relatively coarsely structured groups. Technical and skilled craft occupations, for example, are depicted in a much greater depth of differentiation than occupations in the service sector. One of the consequences is that the occupational activities of men are covered more accurately than those of women, which has often led, and still leads, to misinterpretations of empirical results (Matthes et al. 2008; Kupka, Biersack 2005).

b) Fundamental problems in the system

As early as in 1970, Kosta, Krings and Lutz state in an expert opinion that the then classification of occupations is extremely heterogeneous, knows no uniform structural feature and shows large areas of overlap (Kosta et al. 1970). One of the major points of criticism relates to the varying degree of homogeneity of the classification levels, above all of the Berufsordnungen (Occupational Orders) and Berufsklassen (Occupational Classes).² While the activity performed should represent the central demarcation criterion, other features of demarcation sometimes come to the fore (Stooß/Saterdag 1979: 44), for instance the material used (101

¹ It is true that both classifications were revised several times, but usually only the catalogue of occupational titles was updated and – in order not to jeopardise statistical time comparisons – the classification structure below the level of Occupational Orders was adapted.

² The top hierarchy level of the KldB 88 differentiates between six Berufsbereichen (Occupational Areas) based on the economic activities (crop farmers / animal breeders / fishing occupations; miners / mineral workers; manufacturing occupations; technical occupations; service occupations; other labour). The next level of hierarchy consists of 33 Berufsabschnitte (Occupational Segments that are structured by various criteria (such as activity, type of material processed, object of work). The next breakdown level shows 86 Berufsgruppen (Occupational Groups, 2-digit code) embracing the occupations that are functionally more closely associated and related by their occupational task and activity. The basic unit of the system is represented by the 334 Berufsordnungen (Occupational Orders, 3-digit code) which are to define similar occupational activities as independently as possible from their qualification and position within the company. Lastly, at the bottom breakdown level, 1,991 Berufsklassen (Occupational Classes, 4-digit code) are being differentiated structuring the occupations by type of specialisation (Paulus et al. 2010).

"stone cutter"), the branch of industry (141 "skilled chemical worker"), the training qualification (600 to 607 "engineers", 621-629 "technicians) or the position in the company hierarchy (531 "unskilled labourer") (see Stooß 1988: 766 ff.). Therefore, the results of occupational mobility analyses are often prone to the accusation that they are directly caused by the heterogeneity of the classification of occupations they are based on.

Moreover, the same breakdown levels of the classifications of occupations are differentiated at varying depth levels: On the level of Occupational Orders, the degree of differentiation is sometimes so high that it only covers one occupational activity (e.g. 685 "assistant pharmacist"), and other times so low that it combines various occupations that only be considered as similar. Industry-related occupations in particular have an Occupational Order of their own (e.g. 192 "roller", 221 "turner", 224 "driller"), whereas many service occupations are combined in one Occupational Order. The Occupational Order 781 "office clerks" comprises virtually all occupational activities that can be exercised at an office, starting with management assistants, to HR specialists and paralegals to paymaster clerks. Thus the occupational mobility between occupations in the service sector is systematically underestimated because it cannot be measured between the occupations combined in one Occupational Order.³

Another problem is that positional order criteria are treated inconsistently: For example, 611 "chemist", 626 "assistant chemist" and 633 "chemical laboratory worker" are assigned to various Occupational Orders, whereas the "data processors" (Occupational Order 774) include all positions from application programmer to head of IT department. Thus, for those employed in the chemical industry, a change of position would also involve a change of occupation, whereas this would not be the case for data processors.

Against this backdrop, the goal in the new development of the KldB 2010 was to create an up-to-date, generally recognised classification of occupations meeting the multifarious requirements of use, which, on the one hand, takes into account the special characteristics of the German labour market with its distinct occupation-specific structuring and, on the other hand, enables linking to internationally comparable classifications of occupation (especially the International Standard Classification of Occupations 2008, ISCO 08).⁴ Unlike the former German classifications of occupations that were developed deductively from existing expert knowledge of occupations, the new classification is founded on a theory-driven, empirical analysis of similarities between occupations complemented by a coherence check of these aggregation results. In

³ This problem could also be the cause of the lower vocational mobility of women repeatedly observed because industrial occupations are more frequently held by men and occupations in the service sector more frequently by women (Matthes et al. 2008).

⁴ The decision was made – instead of adopting the ISCO 08 – to develop a new specifically German classification of occupations, because in horizontal terms the ISCO is too insufficiently differentiated to map the occupational pattern on the German labour market. It was nevertheless one of the central objectives in the new development of the KldB 2010 to achieve a very high degree of compatibility with the ISCO 08 through an explicit conversion table in order to meet the challenges of increasingly international counselling and placement in the Federal Employment Agency and to ensure the international comparability of statistical reports and scientific analyses.

order to reach optimal objectiveness in the foundation of the KldB 2010 structure, systematically maintained, occupational information of the Federal Employment Agency was analysed using empirical procedures of classification. This theory-based, empirical procedure is an essential progress in the construction of the classification of occupations (Paulus et al. 2010).

In this report, we first give a brief overview of the KldB 2010. We will particularly explain its systematics and illuminate the structural innovations (see chapter 2). Then, the multi-stage procedure for coding the occupational activity information developed by the Institut für Arbeitsmarkt- und Berufsforschung (Institute for Employment Research – IAB) is transferred to the KldB 2010. We also include instructions for the use of the KldB 2010, particularly in view of the classification rules and assignment principles (see chapter 3). Chapter 4 sums up the necessity of conversion tables and gives an overview of the current conversion tables from and to the KldB 2010.

2 Structure of the Classification of Occupations 2010

2.1 Systematics of the breakdown structure

The Classification of Occupations 2010 is structured as a hierarchical classification with five breakdown levels:

- 10 Berufsbereiche (Occupational Areas, 1-digit code)
- 37 Berufshauptgruppen (Occupational Main-Groups, 2-digit code)
- 144 Berufsgruppen (Occupational Groups, 3-digit code)
- 700 Berufsuntergruppen (Occupational Sub-Groups, 4-digit code)
- 1.286 Berufsgattungen (Occupational Types, 5-digit code)

At the top hierarchy level, the KldB 2010 consists of ten *Occupational Areas (1-digit code)*. Since one digit is not enough to map the complexity of the occupational landscape in Germany, the Occupational Areas do not represent any directly comparable units. They are rather designed to give a good overview of topics and ensure user-friendly handling of the KldB 2010. The Occupational Main-Groups (2-digit code), however, are qualitatively compiled by aspects of contents (Bundesagentur für Arbeit 2011a: 36f.). The Occupational Areas are not suitable for analytical purposes.

2.1.1 Occupational expertise – the horizontal dimension of the KldB 2010

The next three breakdown levels – Occupational Main-Groups (2-digit code), Occupational Groups (3-digit code) and Occupational Sub-Groups (4-digit code) – were defined based on the "expertise" of an occupation which is considered to be the structuring dimension of the KldB 2010. The expertise of an occupation is determined by how strongly the skills, abilities and knowledge required for an occupation coincide in two occupations. For this purpose, these in-

formation as stored in the so-called "Competence Table" of the Federal Employment Agency⁵ was used. With the aid of a cluster analysis of this competence table, the occupations were grouped on the basis of their similarity of required skills, abilities and knowledge. To avoid any misallocation, the cluster results were subsequently subjected to repeated qualitative, occupation expert evaluations (see Bundesagentur für Arbeit 2011a: 37 ff.).⁶ Occupations with a comparable level of similarity were combined on the same breakdown levels of the KldB 2010, i.e. all Occupational Mai- groups, Occupational Groups and Occupational Sub-Groups are characterised by a comparable level of similarity among the occupations combined under them. The deeper the breakdown level is, the greater is the similarity among the occupations. This new systematisation of occupations in the KldB 2010 results in analytically comparable units on the 2-, 3- and 4-digit level at horizontal dimension of occupations.⁷

The Occupational Sub-Groups primarily serve to be able to distinguish occupations with differing specific focuses of activity⁸ from each other. Occupational Sub-Groups with no further spe-

⁵ In the Competence Table of the Federal Employment Agency (Bundesagentur für Arbeit, or BA), each single occupation is assigned with the skills, abilities and knowledge ("competencies") that are required in this occupation ("Core Competencies"), that could be significant in this occupation ("Further Competencies") or that refer to a group of relevant thematically associated "competencies", such as, for example, programming languages, music instruments ("Competence Groups"). A publisher with occupational expertise has been commissioned by the BA to define the "competencies" required for the occupations according to standardised guidelines. These are preferably taken from training regulations or other regulations. Additionally, this assignment which based on formal criteria is supplemented by research of "competencies" demanded on the labour market, for instance by evaluating job advertisements, reviewing feedback from employers and/or professionals of the BA within the framework of customer reaction management, maintaining contacts to institutions such as chambers and associations or observing the vocational and further training market. At the BERUFENET, the BA's online portal (<http://berufenet.arbeitsagentur.de>), you can find the "competencies" assigned to a certain occupation (after entering the job title, select the link "competencies" on the top left of the page!). The Competence Table serves as a basis for the encryption and the matching of vacancies and applicants in the BA's placement system (JOBBÖRSE/VerBIS) or for career orientation (BERUFENET) so that the information filed there is checked for their validity at least once a year and updated, if necessary.

⁶ Note that this "Competence Table" has not been created for the purpose of scientific analysis. Therefore, it cannot be excluded that systematic differences exist regarding the number and differentiation of competencies for the various occupations. Still, we have decided in favour of using this table because it is the only available, comprehensive and systematic accumulation of specific requirements, activities and competencies for current or former occupations in Germany (Bundesagentur für Arbeit 2011a: 31). That is also why it was indispensable to subject the results of the cluster analysis to an additional quality check.

⁷ Since, in the understanding of the KldB 2010, military occupations are characterised by a specific occupational expertise, they get an Occupational Area of their own and are then differentiated by their order of ranks. Accordingly, the KldB 2010 provides four Occupational types (5-digit code): 01104 "officers", 01203 "senior NCOs", 01302 "junior NCOs" and 01402 "members of the regular armed forces in other ranks". Owing to the complexity of the activity of an officer, especially caused by leadership and management tasks, all officers are assigned with Requirement Level '4' (with respect to Requirement Level compare section 2.1.2). Senior NCOs often take on special assignments and training tasks. In many cases, the complexity of their activity is comparable to that of a master craftsman or technician. They are, therefore, assigned with Requirement Level '3'. Junior NCOs and members of the regular armed forces in other ranks are assigned with Requirement Level '2'.

⁸ A specific focus of activity is given whenever the skills, abilities and knowledge in a specific area of activity take up a considerable volume of the overall activity in the Occupational Group.

cialisation are marked with a '0' as the 4th digit in the KIdB 2010. The '8' as the 4th digit is reserved for occupations that, although having a specific focus of activity, cannot be assigned to any of the defined Occupational Sub-Groups. A '9' as the 4th digit of the numerical code in the KIdB 2010 denotes supervisory and leadership personnel.⁹

2.1.2 Requirement Level – the vertical dimension of the KIdB 2010

On the 5th, bottom level, the classification structure is broken down on the basis of the *Requirement Level* – the second dimension of the KIdB 2010. The objective is to be able to depict the various degrees of complexity within those occupations which have a high similarity of occupational expertise (see Table 1).

Four Requirement Levels are distinguished to map the degree of complexity of an occupation. The assumption behind it is that a certain standard of skills, abilities and knowledge must exist for practicing a certain occupation. First of all, the Requirement Levels are guided by the formal vocational qualifications. However, the standard of skills, abilities and knowledge required for practicing an occupation can also be acquired through work experience and learning-by-doing. Here, too, the formal qualification of the person practicing the occupation is irrelevant; the subject of consideration is rather the Requirement Level that is typically demanded for this occupational activity.

Table 1: The four Requirement Levels of the KIdB 2010

Requirement Level		Normally required vocational qualification
1	Unskilled or semi-skilled activities	No vocational qualification, or regular one-year vocational training, required
2	Specialist activities	At least two years of vocational training, also graduation from vocational school
3	Complex specialist activities	Qualification as master craftsman or technician or equivalent technical school or college graduation, also graduation from a professional academy or university bachelor's degree
4	Highly complex activities	Completed university studies of at least four years

⁹ Exceptions are, however, top managers, such as CEOs, heads of public authorities and chairmen. In the understanding of the KIdB 2010, they are "executives without any clear occupational focus or specificity" and are already distinguished from the other occupations in the company organisation on the level of Occupational Groups (3-digit code 711).

In order to also distinguish supervisory personnel from executives, the former including the activities of master craftsmen as well as of team, office or ward managers, supervisory personnel are assigned Requirement Level '3' and executives Requirement Level '4'.

Unskilled or semiskilled activities (Requirement Level 1) typically comprise simple activities of low complexity, the practicing of which usually does not require any specific specialised knowledge beyond basic general school education. Due to the activities' low level of complexity, formal vocational qualification is not a prerequisite. According to a recommendation by the Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung – BIBB), the KldB 2010 also localises all cases of one-year vocational training on this Requirement Level.¹⁰

Specialist activities (Requirement Level 2) are clearly more complex and/or more professionally oriented than unskilled or semi-skilled activities. The proper execution of this activity requires sound expert knowledge, specific skills and abilities. Such activities can usually be practiced only after completing at least two years of vocational training; however, long years of job experience or several years of learning-by-doing may lead to the same result.

Complex specialist activities (Requirement Level 3) are more complex compared to the specialist activities and characterised mainly by the necessity to have special knowledge, skills and abilities. The demands on expert knowledge are higher, and the occupational activities localised here are normally associated with upper expert and management functions. In addition to the respective specialist activity, these occupations usually involve further planning and control activities (such as work scheduling, resource scheduling, quality control and assurance). The skills, abilities and knowledge necessary for these activities are often acquired within the framework of further vocational training. Typical prerequisites for the execution of these activities are the qualification as master craftsman or technician or an equivalent technical school or college graduation. However, appropriate professional experience may be sufficient as well.

Highly complex activities (Requirement Level 4) require a very high standard of knowledge, skills and abilities. Such activities are characterised by, for example, development, research and diagnostic activities, transfer of knowledge as well as management and leadership functions in (major) companies. As a rule, the execution of this occupational activity requires at least four years of university education with successful graduation. However, some of these occupational activities may also call for a PhD or equivalent, or a Staatsexamen (government recognised examination), as a necessary condition for practising these occupations.

¹⁰ Furthermore, it is worth noting the placement of unskilled and semi-skilled occupations: Considering that unskilled or semi-skilled activities are characterised by activity bundles of lower specialisation than specialist activities, they are generally assigned to the Occupational Sub-Group without further specialisation (a '0' as the 4th digit). Only if a specific focus of activity can be identified also for the unskilled or semi-skilled activity, and thus the unskilled or semi-skilled activity is, in the sense of occupational expertise, more similar to its specialists than to the other unskilled workers in the Occupational Group, will you also find Occupational Sub-Groups with specific focuses of activity showing Requirement Level 1.

2.1.3 Job titles in the KldB 2010

Some 24,000 job titles are assigned to the KldB 2010. They are found in the alphabetical list of job titles (Bundesagentur für Arbeit 2011a: 314 ff.) and comprise, in addition to the current, commonly used job titles of the database of the documentation code number of the Federal Employment Agency (see section 3.1), also synonymous or inverted forms of these occupations, comparable job titles in German-speaking foreign countries, precursor occupations of regular training and advanced training vocations, common abbreviations of job titles as well as job titles used in German-language job portals and thus relevant to the labour market.

2.2 Structural innovations compared to former classifications

The new systematisation of occupations and the consistent implementation of structural principles in the KldB 2010 have resulted in a structural breach compared to the previous German classifications of occupations. In particular, the KldB 2010 takes account of the changed structures in the professional world and is, therefore, hard to compare with its preceding versions. The following examples are to demonstrate just how strong the structural breach is compared to former classifications of occupations.

2.2.1 Mapping of current occupational patterns

The cluster analysis has shown that in the KldB 2010, compared to the previous German classifications of occupations, primarily those occupational fields have to be differentiated more strongly which have grown more important in today's working world. This concerns especially commercial and service-oriented occupations that have gained in significance over the last decades in the course of economic and technological change. This becomes very obvious when observing the occupational field of "computer sciences, information and communication technology (ICT)". In the former classifications of occupations, these ICT occupations were all localised in one occupational order (774 "Datenverarbeitungsfachleute - Data processors"). Based on the cluster analysis, however, the ICT occupations are already distinguished from the other occupations at the level of Occupational Main-Groups (2-digit code) in the KldB 2010. According to their specific knowledge and skills, they are then further broken down into 4 Occupational Groups and 22 Occupational Sub-Groups, and finally divided into 31 Occupational Types (5-digit code) (see Table 2).

Table 2: ICT occupations ... in the KldB 88

77	Rechnungskaufleute, Datenverarbeitungsfachleute - Accountants, data processors
774	Datenverarbeitungsfachleute - Data processors
7740	Datenverarbeitungsfachleute, ohne nähere Angabe - Data processors, not specified
7741	Systemanalytiker, Organisatoren - System analysts, organisers
7742	Anwendungsprogrammierer - Application programmers
7743	Systemprogrammierer - System programmers
7744	Rechenzentrumsfachleute - Computer centre specialists
7745	Vertriebsfachleute (EDV) - Marketing specialists (EDP)
7746	Datenverarbeitungskaufleute - Data processing clerks
7748	Informatiker (EDV) - Computer scientists (EDP)
7749	Andere Datenverarbeitungsfachleute - Other data processors

... in the KldB 2010¹¹

43	Informatik-, Informations- und Kommunikationstechnologieberufe - Occupations in computer sciences, information and communication technology
431	Informatik - Computer sciences
4310	Berufe in der Informatik (ohne Spezialisierung) - Occupations in computer sciences (without specialisation)
4311	Berufe in der Wirtschaftsinformatik - Occupations in business information systems
4312	Berufe in der technischen Informatik - Occupations in technical computer sciences
4313	Berufe in der Bio- und Medizininformatik - Occupations in bioinformatics and health informatics
4314	Berufe in der Geoinformatik - Occupations in geoinformatics
4315	Berufe in der Medieninformatik - Occupations in new media informatics
4319	Führungskräfte – Informatik - Executives in computer sciences
432	IT-Systemanalyse, IT-Anwendungsberatung und IT-Vertrieb - IT system analysis, IT application consulting and IT sales
4321	Berufe in der IT-Systemanalyse - Occupations in IT system analysis
4322	Berufe in der IT-Anwendungsberatung - Occupations in IT application consulting
4323	Berufe im IT-Vertrieb - Occupations in IT sales
4329	Führungskräfte – IT-Systemanalyse, IT-Anwendungsberatung und IT-Vertrieb - Executives in IT system analysis, IT application consulting and IT sales
433	IT-Netzwerktechnik, IT-Koordination, IT-Administration und IT-Organisation - IT network technology, IT coordination, IT administration and IT organisation
4331	Berufe in der IT-Netzwerktechnik - Occupations in IT network technology
4332	Berufe in der IT-Koordination - Occupations in IT coordination
4333	Berufe in der IT-Organisation - Occupations in IT organisation
4334	Berufe in der IT-Systemadministration - Occupations in IT system administration
4335	Berufe in der Datenbankentwicklung und –administration - Occupations in database development and administration
4336	Berufe in der Webadministration - Occupations in web administration
4338	Berufe in der IT-Netzwerktechnik, IT-Koordination, IT-Administration und IT-Organisation (sonstige spezifische Tätigkeitsangabe) - Occupations in IT network technology, IT coordination, IT administration and IT organisation (other specific activity information)
4339	Führungskräfte – IT-Netzwerktechnik, IT-Koordination, IT-Administration und IT-Organisation - Executives – IT network technology, IT coordination, IT administration and IT organisation
434	Softwareentwicklung und Programmierung - Software development and programming
4341	Berufe in der Softwareentwicklung - Occupations in software development
4342	Berufe in der Programmierung - Occupations in programming
4349	Führungskräfte – Softwareentwicklung und Programmierung - Executives – software development and programming

¹¹ For a better overview, only the 2- to 4-digit levels of the KldB 2010 are shown here. The positions indicated are further divided on the 5-digit level according to their Requirement Level.

But also for the areas of activity in "environmental protection engineering and environmental consulting", a much more significant role has emerged than was foreseeable at the time the KldB 88 was developed. In the former classifications, the "Umweltschutzingenieure - environmental protection engineers" were still assigned to "Sonstigen Ingenieuren - Other engineers" (Occupational Order 607) and the "Umweltschutztechniker - Environmental technicians" to the "Sonstigen Technikern - Other technicians" (Occupational Order 628). In contrast, the KldB 2010 provides the vocational groups 422 "Umweltschutztechnik - Environmental protection engineering" and 423 "Umweltschutzmanagement und -beratung - Environmental protection management and consulting" giving two independent positions of this area of activity already on the 3rd breakdown level (see Table 3).

Table 3: Occupations in environmental engineering and consulting in the KldB 2010

42	Geologie-, Geografie- und Umweltschutzberufe - Occupations in geology, geography and environmental protection
422	<i>Umweltschutztechnik - Environmental protection engineering</i>
4220	Berufe in der Umweltschutztechnik (ohne Spezialisierung) - Occupations in environmental protection engineering (without specialisation)
4221	Schornsteinfeger/innen - Chimney sweeps
4228	Berufe in der Umweltschutztechnik (sonstige spezifische Tätigkeitsangabe) - Occupations in environmental protection engineering (other specific activity information)
4229	Aufsichtskräfte – Umweltschutztechnik - Supervisory personnel in environmental protection engineering
423	<i>Umweltmanagement und –beratung - Environmental management and consulting</i>
4231	Berufe in der Umweltschutzverwaltung und –beratung - Occupations in environmental protection administration and consulting
4232	Gewässer-, Immissionsschutz- und Abfallbeauftragte - Water, emission protection and waste management representatives
4233	Strahlenschutzbeauftragte - Radiation safety officers
4239	Führungskräfte – Umweltmanagement und –beratung - Executives in environmental management and consulting

By differentiating these fields of occupation in greater depth, the KldB 2010 thus enables current occupational patterns to be mapped in a contemporary manner. But the cluster analysis has also disclosed that occupational fields that were given a lot of space in previous classifications of occupations have to be aggregated more strongly in the KldB 2010. This can be illustrated by the number of positions various national classifications of occupations exhibit on the bottom level. While the KldB 88 maps the single occupations on the most differentiated level in 1,991 systematic positions (and the KldB 92 in 2,287), the number of positions is reduced to 1,286 in the KldB 2010.

2.2.2 Uniform breakdown by complexity of the activities to be performed

An important innovation of the KldB 2010 is that it is now possible to distinguish between occupational activities with different degrees of complexity within one unit of occupational expertise. While in the former classifications of occupations, for example, unskilled or semi-skilled activities were hard to identify, the KldB 2010 now provides the possibility to differentiate activities by

their complexity by means of the Requirement Level. As described in section 2.1, the KldB 2010 displays various Requirement Levels within one Occupational Sub-Group (4-digit code) broken down by occupational expertise. By way of example, Table 4 assigns Occupational Types (5-digit code) from the sector of health, nursing and medical care to the four Requirement Levels in order to give an impression of this newly created possibility of differentiation.

Table 4: Occupational Types in health, nursing and medical care

Requirement Level	Occupations assigned → 5-digit code in the KldB 2010
1: Unskilled or semi-skilled activities	Gesundheits- und Krankenpflegehelfer/in - Health and nursing care helper → 81301
2: Specialist activities	Gesundheits- und Krankenpfleger/in - Nurse → 81302
3: Complex specialist activities	Fachkrankenschwester/-pfleger - Specialist nurse → 81313
4: Highly complex activities	Allgemeinarzt/-ärztin - General practitioner → 81404

2.2.3 Distinction between specialists, supervisors and executives

Previous classifications of occupations also did not distinguish between specialists, supervisors and executives. For example, master craftsman activities used to be included in the Occupational Order of their specialists. As a result, statistical reporting was not able to make any clear statements about the employment of master craftsmen. Since in the KldB 2010, supervisors and executives are identified with a '9' as the 4th digit, it is now possible to distinguish master craftsmen from their specialists, but also from the technicians assigned to this Occupational Sub-Group. They can be set apart from the executives by means of the Requirement Level ('3' as the 5th digit) (see Table 4).

Table 5: Distinction between specialists, supervisors and executives

12	Gartenbauberufe und Floristik - Occupations in horticulture and floristics
121	Gartenbau - Horticulture
1210	Berufe im Gartenbau (ohne Spezialisierung) - Occupations in horticulture (without specialisation)
12101	Helfer- und Anlerntätigkeiten, z.B. Gartenbauhelfer/in - Unskilled or semi-skilled activities, e.g. gardening helper
12102	fachlich ausgerichtete Tätigkeiten, z.B. Gärtner/in - Specialist activities, e.g. gardener
12103	komplexe Spezialistentätigkeiten, z.B. Gartenbautechniker/in - Complex specialist activities, e.g. landscape technician
12104	hoch komplexe Tätigkeiten, z.B. Gartenbauingenieur/in - Highly complex activities, e.g. landscape engineer
[...]	
1219	Aufsichts- und Führungskräfte – Gartenbau - Supervisors and executives in horticulture
12193	Aufsichtskräfte – Gartenbau, z.B. Gartenbaumeister/in - Supervisors in horticulture, e.g. master craftsman in landscaping
12194	Führungskräfte – Gartenbau, z.B. Gartenbaubetriebsleiter/in - Executives in horticulture, e.g. market garden manager

3 Coding of Information on Occupational Activity According to KldB 2010

Information on occupational activities is often used in social science research to allow conclusions with regard to social positioning, socio-economic status or professional prestige. Nearly all common measures, such as socio-economic indices (e.g. class schema according to Erikson, Goldthorpe and Portocarero (EGP), European Socio-economic Classification (ESeC), Magnitude Prestige Scale (MPS), Standard International Occupational Prestige Scale (SIOPS) or International Socio-Economic Index (ISEI)) are based on classifications of occupations (mainly on the ISCO) (cp. Rose, Harrison 2010; Hoffmeyer-Zlotnik, Geis 2003; Ganzeboom, Treiman 2003; Ganzeboom et al. 1992). But also the occupation itself serves as a unit of study, e.g. when analysing occupational mobility or to answer specific questions on the demand of skilled workers or even on the training market. For this reason, it is of great interest to code this information as accurately as possible.

In order to map the occupational pattern that is clearly more multifaceted in Germany than in other countries on the one hand, and to offer occupation information also in an internationally valid classification of occupations on the other hand, it is recommended to code the occupation information according to the KldB 2010 first and then convert them into the respective classification. This recommendation is not only based on the greater diversity of the occupational pattern on the German labour market, but also on the fact that an accurate coding of national occupational activity information is aggravated by a lack of detailed descriptions of the assignment principles of the International Classification of Occupations. The conceptually high degree of connectivity between KldB 2010 and ISCO 08 enables a problem-free conversion from the KldB 2010 to the ISCO 08. Starting from one of these two classifications, other classifications or measures can then be created through further recoding (see chapter 4).

For the coding of information on occupational activities, the IAB has developed a multi-stage procedure that is effective because, on the one hand, it allows a partly automated coding of information on the occupational activity according to the KldB 2010 (see Drasch et al. 2012), and on the other hand, also meets high quality standards. The open information can be allocated to the occupational activity based on a systematic number used by the BA (the so-called documentation code number as described in more detail in the following section), the first 5 digits of which correspond to the KldB 2010. However, the paper on hand also serves as an instruction for an individual coding of occupation information. Since the BA's online search system, which allows the occupational activity information to be manually allocated to this documentation code number can be accessed on the Internet (<http://berufenet.arbeitsagentur.de/dkz/Start.do>), coding according to the KldB 2010 can be done on one's own provided the recommendations documented here are complied with.

3.1 The Dokumentationskennziffer - documentation code number (DKZ)

The database of the documentation code number (DKZ) is used within the framework of BA placement and counselling inter alia for the encryption and the matching of vacancies and applicants in the BA's online job portal (JOBBÖRSE/VerBIS). Thus it originates from the BA's operational business and is updated on a regular basis. In addition, the code number is used in the BA statistics for encrypting academic and job titles. The DKZ database includes a comprehensive collection of all job and academic titles used in Germany, their systematic number (in the following referred to as 8-digit DKZ) and further information. The permanently updated database consists of metadata of many information systems of the BA and is used, inter alia, for the description of activities in the information system BERUFENET (<http://berufenet.arbeitsagentur.de/berufe/>). All academic and job titles used were defined by the BA and allocated to various search terms. In addition to current titles, the database also contains job titles no longer in use.

The first five digits of the 8-digit DKZ are identical to the 5-digit code of the KldB 2010. The first of the further three digits allows distinguishing activities (recognisable by the figures 1 and 2) of training (recognisable by the figures 8 and 9). The last two digits are assigned randomly and serve to further differentiate the job titles. So if coding is to be performed according to the KldB 2010, only the first five digits are relevant.

3.2 The coding procedure

It is recommended to carry out the coding in several steps: The first step involves automatic coding. Automatic coding reduces the effort of manual coding considerably. Not only is it possible for a certain part of the job titles to unambiguously assign them to codes. It is also possible to use them for a subsequent facilitated manual assignment if few alternative codings are definable.

In a second step, the information not automatically codable should be coded manually by trained coders following clear rules. In a third step, the information that has not yet been coded should be checked by supervisors and either coded or marked as unsuitable for coding.

Normally, the information on the occupational activity is collected by means of two open questions, with the second activity information specifying the first in more detail. In the following, we will therefore explain the procedure for coding such a dual collection of occupational activity information. However, the coding based on one piece of information of the occupational activity can bring nearly equivalent results if the necessary adjustments are made.

3.2.1 First step: automatic coding

Automatic coding can be conducted by allocating the codes to occupations that are available in the BA's electronic keyword indices.¹²

The occupation information should first be matched with the data from the database containing the so-called end points.¹³ These end points are occupations that are assigned one-to-one to a DKZ and thus to a code according to the KldB 2010. This database includes each a short and long form, male and female, of the job title. Based on approx. 10,500 end points for occupational activities, you thus end up with a database comprising approx. 42,000 entries. Both the currently valid and the obsolete end points can be considered here.¹⁴ If a piece of information regarding the occupational activity coincides with an entry of the register, a 5-digit code is assigned to the KldB 2010.

Then, any information not codable in this manner should be compared to data of the search term database.¹⁵ In the search term database, job titles are each allocated to several end points. There are male and female, but also neutral search terms, such as e.g. agriculture, pre-fabricated concrete parts or management. This database comprises approx. 101,000 entries. If a piece of information regarding the occupational activity coincides with an entry of the register, one or more 5-digit codes are assigned to the KldB 2010. For such entries, the coder must subsequently decide manually, following the rules described in the next section, whether a code is appropriate and which code best matches the respective activity information.

In an interview, normally two entries for the description of the occupational activity are recorded. In the coding process, the two pieces of information must be coded separately so as to allow for the possibility that the coding of the first information leads to a different result than the coding of the second information. In case of one identical hit for both pieces of information, the respective code can be taken as the result. If job titles have different hits in the codes, again the coder has to make a decision manually based on the rules described in the following section which of the codes is best suited for the respective case.

3.2.2 Coding of occupation information without automatic hits

Occupation information that cannot unambiguously be coded automatically should be converted into codes by trained coders (see details on coder training in section 3.3). In the following we assume that, in addition to the information collected regarding the occupational activity, the

¹² The lists in question are updated on a daily basis and can be downloaded in the BA's download portal: <http://download-portal.arbeitsagentur.de/files/>.

¹³ The file in the BA's download portal is named: alleBerufe.txt.

¹⁴ This makes sense especially when not only information on the current occupation is coded, but also activities that are termed differently today than they used to be (e.g., obsolete: motor mechanic, current: automotive mechatronics technician).

¹⁵ The file in the BA's download portal is named: B_SW.txt.

coders also have information regarding the Differenzierte Berufliche Stellung (Differentiated Occupational Status).

Basic procedure

For the coding, first an occupational allocation and then the grouping into a specific Requirement Level (5-digit) is conducted. Basically, the first step is to enter the occupational activity into the online search of the DKZ database (<http://www.berufenet.arbeitsagentur.de/dkz/Start.do>). Any typing or spelling errors must be corrected by the coders at this point as the entries in the search engine must be orthographically correct. The following example is to demonstrate this procedure: If you enter the term "Logistiker - Logistician" into the search screen of the DKZ database and confirm this by clicking "Search", the results shown in the following figure appear (see Figure 1).

Figure 1: Screen display in online search of DKZ database after entering the term "Logistiker - Logistician"

The screenshot shows the search results for "Logistiker". The table below is a representation of the data shown in the image.

Bezeichnung	Berufskundl. Gruppe	TS 2010	TS 2003
Betriebswirt/in (Abi-Ausbildung) - Verkehr/Logistik	Fachkräfte	51613	701
Betriebswirt/in (Fachschule) - Logistik	Fachschulberufe	51623	752
Betriebswirt/in (Hochschule) - Logistik	Hochschulberufe	51624	607
Fachkaufmann/-frau - Einkauf und Logistik	Fachschulberufe	51623	752
Fachkraft - Lagerlogistik	Fachkräfte	51312	741
Fachkraft - Lagerwirtschaft	Fachkräfte	51312	741
Fachkraft - Logistik/Materialwirtschaft	Fachschulberufe	51312	752
Fachwirt/in - Güterverkehr und Logistik	Fachschulberufe	51623	701
Leiter/in - Logistik	Sonstige Tätigkeiten	51694	752
Logistiker/in	Sonstige Tätigkeiten	51624	752
Sachbearbeiter/in - Logistik	Sonstige Tätigkeiten	51623	752
Zahlagerist/in - Zahlagerverwalter/in	Fachkräfte	51312	741

Further information: [Weitere Informationen zum Tätigkeitsschlüssel 2003 \(TS 2003\) und zum Tätigkeitsschlüssel 2010 \(TS 2010\) erhalten Sie auf den Internet-Seiten des zentralen Betriebsnummerservice der Bundesagentur für Arbeit.](#)

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The first column lists the job titles that can be associated with the entry "Logistiker - Logistician". Listed next are the "Berufskundliche Gruppe - Career Group" (providing information on the associated Requirement Level, and thus the 5th digit of the KldB 2010), then the column "TS 2010" (showing the first five digits of the **Tätigkeitsschlüssel 2010**, and thus the 5-digit code of the KldB 2010) and the column "TS 2003" (listing the first three digits of the Tätigkeitsschlüssel 2003, and thus the 3-digit code of the KldB 88).

In order to define a 5-digit code in the KldB 2010, one should proceed as follows:

- If the table lists a job title that corresponds to the activity information, the 5-digit code is noted in column "TS 2010". Should the occupation information to be coded not be in one hun-

dred per cent agreement, it must be allocated to that Occupational Type (5-digit code) which includes the occupations with the greatest similarity to the occupation information to be coded.

- The occupational activity actually performed is the only decisive criterion here. A person's formal vocational training or job experience are of no consequence for the coding of the activity information.
- If respondents have indicated several job titles, the more special activity information must be coded. For example, if "Lehrer - Teacher" and "Gymnasiallehrer - Grammar School Teacher" are indicated, the latter will be coded.
- It should then be checked whether the Differentiated Occupational Status identified in the survey corresponds to the Career Group listed in the table (see Table 6).

Table 6: Fit of Career Group and Differentiated Occupational Status

Career Group	Differentiated occupational status
"Activities requiring no qualification" (Requirement Level 1)	Semi-skilled worker, unskilled labourer, employee with simple activity (e.g. sales assistant), lower-grade civil servant (up to and including Oberamtsmeister/in - Upper service manager)
"Skilled labour" (Requirement Level 2)	Skilled worker, journeyman, assistant, employee with qualified activity (e.g. administrative clerk, technical draftsperson, middle-grade civil servant (from assistant up to and including chief secretary or senior public official)
"Occupations requiring technical college graduation" (Requirement Level 3)	Foreman, crew leader, brigade leader, master craftsman, construction foreman in labour force, upper-grade civil servant (from inspector up to and including senior administration official as well as elementary, middle and main school teacher)
"Activities requiring a university degree" (Requirement Level 4)	Employee with highly qualified activity (e.g. scientific assistant, high-grade civil servants (senior executive officer and up, e.g. high school teacher)
"erweiterte KldB 2010-Liste - extended KldB 2010 list", „Sonstige Tätigkeiten – Other activities", „Tätigkeiten mit unterschiedlichen Zugängen - Activities with various accesses", „Beamtentätigkeiten, einfacher und mittlerer Dienst - Civil service activities, lower and middle grade", „Beamtentätigkeiten, gehobener und höherer Dienst - Civil service activities, upper and high grade", (unclear Requirement Level)	NOTE! Here, the allocation must be checked based on the description of the occupation in BERUFENET.

If the Career Group and the Differentiated Occupational Status coincide, the occupational title is coded with the digit sequence in the column "TS 2010". In the example, the code number 51312 could then be adopted for "Fachkraft Lagerlogistik - Skilled worker warehouse logistics" if the

reported Differentiated Occupational Status indicated is "Angestellte/r mit qualifizierter Tätigkeit - Employee with qualified activity".

If the Career Group does not coincide with the Differentiated Occupational Status, a job title must be found in the table in which the job title is identical (or similar) and the Career Group coincides with the Differentiated Occupational Status. If the respondent has indicated that he works as a qualified employee, this Differentiated Occupational Status does not correspond to the Requirement Level "highly complex activities" ('4' as the 5th digit in the KldB 2010), but rather the Requirement Level "specialist activities" ('2' as the 5th digit in the KldB 2010), and a job title has to be selected in the list that corresponds to the occupation information and the Differentiated Occupational Status (in the example "Logistiker - Logistician": the title "Fachkraft – Logistik/Materialwirtschaft - Skilled worker – Logistics / material management", code number 51312).

If, in the column of Career Groups, the job title is followed by unspecific information, such as "erweiterte KldB 2010-Liste - extended KldB 2010 list", „Sonstige Tätigkeiten - Other activities“, „Tätigkeiten mit unterschiedlichen Zugängen - Activities with various accesses“, „Beamten-tätigkeiten, einfacher und mittlerer Dienst - Civil service activities, lower and middle grade “ oder „Beamten-tätigkeiten, gehobener und höherer Dienst - Civil service activities, upper and high grade“, it must be checked more closely to which Requirement Level to allocate the job title. For this purpose, you can enter the job title or the respective code number into the column "TS 2010" BERUFENET (<http://berufenet.arbeitsagentur.de/berufe/>) and, after selecting the appropriate links under "access" read exactly which qualification requirements must normally be met for performing this occupation. In the example "Logistiker - Logistician", it says there that "a study of business sciences or an apprenticeship or further training in the area of logistics is required". Accordingly, the logistician is assigned with Requirement Level '4' (thus the 5-digit code 51624 which is also listed under the "Systematiknummer - Systematic Number") if the Differentiated Occupational Status corresponds to one of the points indicated in the line "Activities requiring a university degree" in Table 6.

Peculiarities in the assignment to an Occupational Sub-Group (4-digit code)

One of the objectives of the expertise-oriented Classification of Occupations is to assign the occupational activities to a specific Occupational Sub-Group (4-digit code) by their occupational expertise (see section 2.1.1). In this process, the following peculiarities must be observed for the Occupational Sub-Group (4-digit code) of the KldB 2010:

"Activities without specialisation": Job titles not revealing any specific focus of activity within an Occupational Group (3-digit code) are normally marked with a '0' as the 4th digit in the KldB 2010.

Examples: The occupation "Pferdewirt/in - fully qualified groom" is assigned to the Occupational Sub-Group 1130 "Berufe in der Pferdewirtschaft (ohne Spezialisierung) - Horse management (without specialisation)" because the focus of the activity carried out

(e.g. "Pferdezucht - Horse breeding" (1131) or "Reiten - Horseback riding" (1132) is not known.

The occupation " Bauingenieur/in - Construction engineer" is found in various Occupational Sub-Groups depending on specialisation and type of activities performed: Provided that the specialisation becomes apparent in the job title, it can be coded, e.g. "Stahlbauingenieur/in - Steelworks engineer" (2441), "Schiffbauingenieur/in - Shipbuilding engineer" (2524), etc. If, however, only the activity "Bauingenieur/in - Construction engineer" can be identified, the title will be allocated to the Occupational Sub-Group 3110 "Berufe in der Bauplanung und -überwachung (ohne Spezialisierung) - Occupations in construction planning and supervision (without specialisation)".

"Other specific activity": If the job title mentions a specialisation that is not allocated to any of the existing Occupational Sub-Groups (4-digit code), this information can be coded as "other specific activity" by coding an '8' as the 4th digit.

Example: The occupation of "Pelztierzüchter/in - fur bearing animal breeder" is assigned to the Occupational Sub-Group 1128 "Berufe in der Tierwirtschaft (sonstige spezifische Tätigkeitsangabe) - Occupations in animal agriculture (other specific activity information)" because the activity focus is neither in "Nutztierhaltung (außer Geflügelhaltung) - Livestock husbandry (except poultry farming)" (1121), nor in "Geflügelhaltung - Poultry farming" (1122) nor in "Imkerei - Beekeeping" (1123). But this occupation does have a focus, so that allocation to the Occupational Sub-Group '0' (without specialisation) would not be justified either.

"Supervisors and executives": Occupational activities dominated by executive and leadership functions (discernible above all by budget and personnel responsibility), are identified by a '9' as the 4th digit in the KldB 2010. Supervisors and executives are also (to the extent possible) localised in their fields of activity according to occupational expertise.

Example: The occupation "Farmleiter/in (Tierzucht) - Farm manager (animal breeding)" is allocated to the classification unit "Aufsichts- und Führungskräfte – Tierwirtschaft - Supervisors and executives in animal agriculture" (1129) because the activity is focused on the management of an agricultural enterprise.

A distinction is made between supervisors and executives by allocating the Requirement Level '3' to all supervisors and the Requirement Level '4' to all executives. As a result, it is, for example, possible to set apart the occupations "Stationsleiter/in – Krankenpflege/Altenpflege - Ward manager in nursing / geriatric care" (81393) and "Klinikdirektor/in - Hospital director" (81394).

However, top managers, such as CEOs, heads of public authorities and chairmen, are not localised according to occupational expertise, but coded as "Geschäftsführer/innen & Vorstände - hoch komplexe Tätigkeit - CEOs and chairmen - highly complex activities", thus with the code 71104.

Unskilled or semi-skilled activities

Since unskilled and semi-skilled activities comprise less specific activities, they are normally allocated to the Occupational Sub-Group without specialisation (marked by '0' as the 4th digit). Based on the low level of complexity of their activities, they are assigned with Requirement Level '1' ("unskilled and semi-skilled activities). Every Occupational Group (3-digit) normally has one sub-group (4-digit) under which Requirement Level 1 "unskilled and semi-skilled activities" can be found. So, for instance, all farm hands (e.g. "Erntehelfer/in - Harvest worker", "Spargelstecher/in - Asparagus harvester", „Obstpflücker/in - Fruit picker" etc.) are allocated to KldB 2010 under 11101 "Berufe in der Landwirtschaft (ohne Spezialisierung) – Helfer-/Anlerntätigkeiten - Occupations in farming (no specialisation) – unskilled or semi-skilled activities". In exceptional cases, there are also unskilled and semi-skilled activities (Requirement Level 1) in the more specific Occupational Sub-Groups. This, for example, applies to the occupation "Kindergartenhelfer/in - Nursery School Teaching Assistant" that is allocated to the same 4-digit code as the occupation "Erzieher/in - Nursery School Teacher" (8311 "Berufe in der Kinderbetreuung und -erziehung - Occupations in child care and education") with the distinction being made by means of the 5th digit.¹⁶

Further principles of assignment

Furthermore, the following principles of assignment should be applied to the coding of individual job titles:

"Industrial versus artisanal activities": There are some occupations for which job titles are found both in industrial production and in arts and crafts. This can best be illustrated in an example: The glass blower can resort to nearly identical knowledge regarding the material of glass; however the industrial activity of glass blowing differs strongly from the glass blowing in arts and crafts. Products in arts and crafts are usually handcrafted, which requires a certain degree of artistic skills and abilities, whereas industrial production normally requires skills and abilities in handling mostly complex machinery. Consequently, occupations in industrial manufacturing should be allocated to an Occupational Sub-Group in the Occupational Area 2 "Rohstoffgewinnung, Produktion und Fertigung - Raw material extraction, production and manufacturing". The glass blower in industrial production should thus be allocated to the Occupational Sub-Group 2133 "Berufen in der industriellen Glasbläserei - Occupations in indus-

¹⁶ Further examples are: 11211 "assistant in livestock farming", 11711 "assistant in forestry", 21111 "assistant in mining, opencast mining", 23111 "assistant in glass manufacturing and processing", 21411 "assistant in ceramics", 23411 assistant in printing", 24411 "assistant in metalworking", 25131 "meter reader", 28221 "assistant in textile processing", 33211 "assistant in painting and varnishing", 41311 "assistant in chemical and pharmaceutical manufacturing", 51311 "assistant in warehouse management and transportation", 51321 "assistant in courier, delivery and postal services", 52531 "forklift operator", 53241 "member of judicial police (in lower-grade service)", 63221 "assistant in hotel business", 73231 "tax official (in lower-grade service)", 73241 "customs official (in lower-grade service)", 81341 "assistant in rescue service", 823311 "assistant in hairdressing", 83111 "nursery school teaching assistant", 83131 "assistant in curative education", 83211 "assistant in home economics, 91341 "mystery shopper".

trial glass blowing". If the focus of activity is, however, on craftsmanship, the assignment should be made in Occupational Sub-Group 93 "Produktdesign und kunsthandwerkliche Berufe, bildende Kunst, Musikinstrumentenbau - Product designs and handicrafts, fine arts, instrument making". The glass blower in handicrafts should thus be allocated to the Occupational Main-Group 9343 "Berufe in der kunsthandwerklichen Glasbläserei - Occupations in artisan glass blowing".

"Manufacturing versus processing": The Occupational Groups (3-digit) and the Occupational Sub-Groups (4-digit code) are sorted – wherever possible and reasonable – according to the flow of the process chain. A distinction is usually made between manufacturing and processing of the products. For example, in the Occupational Main-Group 28 "Textil- und Lederberufe - Textile and leather occupations", the activity of a "Weber - Weaver" (2812 "Textilherstellung - Textile manufacturing") is set apart from that of a "Schneider - Tailor" or "Näher - Sewer (2822 "Textilverarbeitung - Textile processing"). It is, therefore, helpful for the allocation of occupations to determine the position within the process chain.

"Teaching and training occupations": The teaching and training activities are combined in a common Occupational Main-Group 84 "Lehrende und ausbildende Berufe - Teaching and training occupations" because the activities to be performed (e.g. preparation of lessons, learning progress monitoring, etc.) and the required knowledge and skills (e.g. methodology, didactics, educational theory) are complementary. Although the respectively allocated occupations require knowledge about various subject areas, the common structuring element for these occupations is the activity of training and teaching.

"Military occupations": The KldB 2010 provides a dedicated Occupational Area for the military occupations ('0' as the first digit) with four Occupational types corresponding to the ranking of the activity:

- 01104 "Offiziere - Officers" are executives who take on a multitude of tasks in a leading position and thus fulfil similar functions as managers in large civilian companies (ranks from lieutenant or naval lieutenant to general or admiral).
- 01203 "Unteroffiziere mit Portepee - Senior NCOs" mainly carry out specialist tasks or training and leadership functions in the armed forces (rank from sergeant or petty officer to warrant officer class to midshipman or senior midshipman)
- 01302 "Unteroffiziere ohne Portepee - Junior NCOs" carry out various tasks, depending on their career, as specialists in special service without leadership responsibility (ranks from sergeant or petty officer second class to staff sergeant).
- 01402 "Angehörige der regulären Streitkräfte in sonstigen Rängen - Members of the regular armed forces in other ranks" perform various activities in the armed forces. They can, for example, carry out a wide range of activities in the support and service sector, from support in planning and execution of comprehensive logistic operations to the use of satellite-based reconnaissance, but also work as vehicle operators or in medical services (ranks: soldier,

seaman recruit (German armed forces), short-service volunteer, temporary-career volunteer, etc.)

Instructions for the formulation of specific coding rules

The assignment principles described are not and cannot be exhaustive. It must often be decided on a case-by-case basis what Occupational Type (5 digit code) the job title belongs to. To make the allocation easier in the individual case, one should additionally fall back on the descriptions created during the development of the KldB 2010 (see vol. 2 of KldB 2010, Bundesagentur für Arbeit 2011b). A systematic classification of these descriptions is to facilitate the handling. Each description includes:

- a brief description of the contents,
- a list of the tasks, activities, knowledge and skills normally characterising the core of the classification unit,
- a listing of the systematic positions of the subordinate classification levels, and
- negative delimitation indicating similar activities that are localised elsewhere in the classification.

3.2.3 Coding of cases of doubt

In the coding of occupational information, it happens again and again that information on the occupational activity is unclear or insufficient, or that the application of the general classification rules (described above) fails to lead to an unambiguous 5-digit code of the KldB 2010. Cases where information on occupational activity cannot be assigned a 5-digit code or where the coder is unsure about issuing the code are classified as difficult cases and, in a further step, will be coded by supervisors with the help of further information, e.g. regarding the industry/sector, the employment history or the level of training, etc. To ensure a harmonised approach, clear orientation aids for the coding should be defined here as well.

Especially the following information has proven to be helpful for the decision about which coding should be carried out in case of doubt:

Information on industry/sector: Information on the industry/sector can be considered to allow the allocation of unspecific occupation information.

Example: If only the Requirement Level is indicated as occupational information, for example unskilled labour, the industry information "Bau - Construction" can be used to carry out a coding as "Bauhilfsarbeiter/in - Construction labourer".

Number of employees: The number of employees can be used to enable the coding of a self-employed mason either as "master mason" or as "CEO of a construction firm". The general rule says that an executive ("CEO") has to employ or instruct at least ten employees. If the number of employees is smaller than ten, the information as master craftsman (Requirement Level '3') is coded in the respective occupation.

Employment history: If the information on occupational activity refers only to the previous employment episode, e.g. "ditto" or "same as before", the employment history has to be consulted to carry out an appropriate coding.

Level of training: For determining the proper Requirement Level, it is sometimes not sufficient to consider the information on the Differentiated Occupational Status alone because this information can contain errors as well. If, for example, a respondent states that he works as a physician, but that in this work he holds a Differentiated Occupational Status as "employee with simple activity", there is reason for doubt. In cases of doubt, and only then, must the coding consider the level of training of the respondent: If an activity is carried out that can usually be performed by university graduates only, and if the respondent has completed university studies, it is most likely that he/she actually exercises this activity on the Requirement Level "activities requiring a university degree" (with a 4 as the 5th digit in the KldB 2010). As a general rule, one can use the allocations of normally required vocational qualification as shown in Table 1 to the Requirement Levels (in section 2.1.2). However, it can also happen that the Differentiated Occupational Status is evidently over-estimated, e.g. if an automotive mechatronics technician considers himself as an engineer and not as a qualified specialist. In this case, too, the person's level of training reached can be consulted in order to ensure correct coding of the Requirement Level.

Multiple job titles: If several job titles are indicated in an employment episode, and it is evident that we are not dealing with the compilation of several consecutive employment episodes, but, for instance, with a job in a temporary employment relationship, that activity will be coded which can be identified as the main activity or (quite pragmatically) the first one mentioned. If we are dealing with a compilation of several consecutive employment episodes, this episode must – to the extent possible – be broken down into single employment episodes, and the respective job titles must be coded individually.

Information cannot be assigned: If a piece of information cannot be assigned because it is illegible, or does not make sense, or even seeking the help of all additional information and rules does not help in allocating it to a code number in the KldB 2010, it will be marked as "information cannot be assigned".

3.3 Quality assurance

The following describes in greater detail how the quality of coding can be assured. In general it can be said that a high level of reliability in coding is only possible if, in addition to the coders' training, the coders are subject to permanent supervision. For empirically testing the reliability of coding, some of the occupation information should always be double-coded blindly, i.e. a part of the job titles to be coded should be coded again by another coder. A subsequent data check is another means for detecting and eliminating frequently occurring coding errors (see Drasch et al. 2012).

3.3.1 Coders' training

The coders performing the coding of the occupational activity and training information should receive at least a 5-hour training in which the theoretical principles of the classification of occupations and the practical procedures in coding are explained.

In the theoretical part, the KIdB 2010 and the BA's DKZ database should be introduced. In this process, it is very important to visualise the coding objective – encrypting activity information in digit sequences according to preferably standardised criteria – and to define their relevance for the quality of the intended empirical analyses. Then, the information to be coded is described, including the additional information made available for coding (Differentiated Occupational Status, etc.) and the working tools to be used (such as the BA's online database and the BERUFENET) are introduced. Following the explanation of the basic rules of coding, the specific procedure for coding should be adequately exemplified. At first the simple cases, but later all special cases should be reviewed and demonstrated by way of examples.

Finally, the coders should work out model cases on their own within a limited period of time. They should include both simple and difficult cases. The coding of these model cases should then be discussed and explained within the coding group. This should serve as a good basis for a high level of coding reliability.

3.3.2 Supervision, double coding

In order to further improve the quality of coding, supervisors should check the first 300 pieces of information manually coded for compliance with the basic rules and give appropriate feedback to the coders.¹⁷ Throughout the coding phase, it must be ensured that a supervisor is always available to answer any questions that may occur. Furthermore, it is the supervisors' task to organise and control the administration of the information to be coded.

As a further coding reliability check, at least 20 per cent of the information not automatically codable should undergo a process of (blind) double coding for analysing the inter-coder reliability after approximately half of all job titles have been coded. To be specific, about 20 per cent of the information should be selected at random and coded again by other coders (therefore 'double') without knowing the initial coding (therefore 'blind'). The inter-coder reliability is defined on the basis of these two coding processes. This reliability thus characterises the degree of consistency of the results of two coders having coded the information independently of each other.

¹⁷ In order to keep the reliability at an equally high level throughout the coding process, these 300 codes per coder should afterwards NOT be considered as reliable coding!

3.3.3 Subsequent data check

In order to further increase the reliability of coding, we recommend additional specific, technical verification steps to conclude the coding work:

Unskilled labour

Since in the development of the KldB 2010, the mapped dimensions (occupational expertise and Requirement Level) are clearly separated for the first time in the German context, attention must be paid during coding to also map the Requirement Level in a consistent manner. This applies to the unskilled and semi-skilled labour in particular. It should, therefore, be checked for all occupational activities that have indicated an unskilled position for their Differentiated Occupational Status whether they are indeed reflected in Requirement Level '1'. Should this not be so, such cases must be recoded.

Master craftsman

The KldB 2010 understands all master craftsman activities to be supervisory activities. These are characterised by a '9' as the 4th digit and a '3' as the 5th digit. The assumption that the specialisation of master craftsmen is dominated by the supervisory activity is also reflected in the key word index of the KldB 2010 and in the search terms within the BA's DKZ. However, this also entails that master craftsmen are always understood to be supervisors. But one cannot automatically assume that all master craftsmen actually work in supervisory positions. Therefore, occupational activities indicating "master craftsman" as Differentiated Occupational Status require a special verification. By means of the precise job title and by checking the information on personnel responsibility, it should be verified whether it is justified for the coding to always end in '93' or whether an allocation into the group of specialist activities is more appropriate.

Executives

The situation is similar in the group of executives. Since the description of the occupation is not necessarily indicative of a leadership position, it should be verified, by checking the information on staff leadership, whether it is justified for the coding of occupation information to end in '94'. It should be observed here that it is not possible to simply adjust the last two digits in the KldB 2010 because executives as systematic positions are not provided for in all areas of the KldB 2010. Precise coding always requires resorting to the actually available systematic positions.

4 Conversion Tables

A new classification of occupations can ideally be expected to be compatible both with the existing German classifications of occupations (KldB 88 and KldB 92) and with the International Classification of Occupations (ISCO 08). However, it cannot do justice to these two objectives equally and completely because the classifications mentioned are based on partly different structural principles and on different understandings of occupation, and they use different criteria to determine the similarity and relatedness of occupational activities and occupations. In addition, the thematic priorities of the systematics vary significantly from one another, which becomes particularly evident from the selection of the main structural characteristics (qualification and/or requirement level in the ISCO versus industrial sectors in the KldB 88).

Since in the development of the KldB 2010 priority was given to the compatibility with the ISCO 08 rather than compatibility with the existing national classifications, the conversion table between KldB 2010 and ISCO 08 is, above all, characterised by high quality. But in the course of the development of the KldB 2010, not only detailed conversion tables for the transition from KldB 2010 to ISCO 08 were created, but also for the transition from KldB 2010 to KldB 88 and to KldB 92. In addition, conversion tables were also created for the transition from KldB 88 and KldB 92 to KldB 2010 (see homepage of KldB 2010¹⁸). Since only about 60 per cent of the 4-digit codes of the KldB 88 or the KldB 92 can be unambiguously assigned to a 5-digit code in the KldB 2010, subsequent recoding of the information encrypted according to KldB 88 or KldB 92 into the KldB 2010 should be refrained from. In order to allow time series comparisons to be performed, it is optimally recommended to recode the Occupational Types (5-digit code) of the KldB 2010 into the Occupational Orders (3-digit code) of KldB 88 and KldB 92. At present, however, only a first, preliminary version of a conversion table from the KldB 2010 (5-digit code) to the KldB 88 (3-digit code) is available (see section 4.2)

The conversion tables relate to focus conversions, i.e. in addition to the unambiguous conversions (one-to-one conversion), also those will be included which combine various source codes into one target code (n-to-one conversion) and which take one source code into various target codes (one-to-n conversion). In the case of a one-to-n conversion (i.e. if one source code leads to various target codes), a focus code is defined, i.e. the target code is indicated where the majority of the occupations originally combined in the source code is localised. However, all further eligible target codes are mentioned by way of alternatives.¹⁹

¹⁸ On the homepage of the KldB 2010, you can download both the two volumes of the Classification of Occupations and further documents on the development of the KldB 2010 as well as the tables with the available conversion tables.

<http://statistik.arbeitsagentur.de/Navigation/Statistik/Grundlagen/Klassifikation-der-Berufe/KldB2010/KldB2010-Nav.html>.

¹⁹ A more precise conversion can, however, be realised by the use of additional information: For example, it is possible to achieve an improvement of the compatibility between the various occupation in-

4.1 Conversion from KIdB 2010 to ISCO 08

In 2011, simultaneous with the KIdB 2010, the International Standard Classification of Occupations, further developed by the International Labour Organisation, ILO, was implemented in the version of 2008 (ISCO-08, ILO 2012) and thus superseded the preceding versions of 1988. The ILO revised the previously used version of the ISCO 88 with the objective to provide an up-to-date classification that can be handled more efficiently and can be used by the national labour administrations and by the individual countries for the 2011 census. The ISCO structures occupational activities based on two dimensions – skill level and skill specialisation. The structure-determining dimension is the skill level. The skill level is recorded in four steps and reflects the degree of complexity of the respective occupational activity. The second dimension – skill specialisation – is an occupational expertise criterion that maps the type of activity performed.²⁰

The compatibility with the ISCO 08 is one of the two central requirements that were made on the new German Classification of Occupations already at the beginning of the development project and have been continuously considered in the structuring process. The objective was to achieve a unilateral compatibility of the KIdB 2010 with the ISCO 08 on the respectively most differentiated level so as to allow international comparability of occupational data. Unilateral refers to the degree of differentiation of the national classification being clearly higher than that of the ISCO 08. In order to reach this objective, the compatibility requirement has been taken into account already at an early stage. First in the selection of the dimensions by which the KIdB 2010 was to be structured, secondly in the way specific Occupational Groups were handled, and thirdly through an early compatibility check in which a comparison was made between the KIdB 2010 (5-digit code) and the ISCO 08 (4-digit code).

With the help of the detailed descriptions of the ISCO 08 positions, the KIdB 2010 assignment principles and the designations of systematic positions, each 5-digit code of the KIdB 2010 was assigned with one or more 4-digit codes of the ISCO 08. In order to enable a standardised compatibility check, further general assignment principles were formulated in the beginning. (1) The assignment is made in accordance with the structural principles of the KIdB 2010, i.e. first of all the occupational expertise should be localised and, if possible, the Requirement Level of the 5-digit code of the KIdB 2010 to be assigned should correspond to the "skill level"

formation by using the information of the economic sector in which the activity is performed or by referring to the position within the company associated with the activity performed. The following is, however, based on the assumption that only the occupation codes are to be converted, without any additional information.

²⁰ The English version of the ISCO 08, an explanation of the structure as well as descriptions on the classification units can be downloaded on the ILO websites on the ISCO 08: <http://www.ilo.org/public/english/bureau/stat/isco/isco08/index.htm>.

A German version of the ISCO 08, an explanation of the structure, descriptions and a key word index are available on the websites of Statistik Austria: http://www.statistik.at/web_de/klassifikationen/oeisco08_implementation/informationen_zur_isco08/index.html.

of the 4-digit code of the ISCO 08. (2) The assignment is made as specifically as possible to avoid the generation of "reservoirs" and/or their being filled disproportionately often.

A simple measure has been selected for measuring the compatibility between the KldB 2010 and the ISCO 08. It calculates the share of source codes (5-digit codes of the KldB 2010) that can be unambiguously assigned to a target code (4-digit code of the ISCO 08) based on the total quantity of source codes. The Federal Statistical Office has continuously reviewed the compatibility of the KldB 2010 with the ISCO 08 in detail throughout development process. This has enabled the BA to make the necessary adjustments in close coordination with the Federal Statistical Office and to improve the compatibility step by step.

Some 90 per cent of the positions on the lowest level of hierarchy of the KldB 2010 can be unambiguously assigned to one of the positions on the lowest level of hierarchy of the ISCO 08 (unit groups). The other 10 percent of the positions in the KldB 2010 are usually divided between two unit groups of the ISCO 08, with this percentage being higher only in single cases. Thus, against the backdrop of the necessity to adequately map the professional world in Germany, the greatest possible, but at the same time a sufficient, compatibility between the KldB 2010 and the ISCO 08 has been reached. Compared to the present situation where about one third of all positions of the KldB 92 and more than half the occupation information coded according to the KldB 92 cannot be unambiguously assigned to a position of the ISCO 88, considerable progress has been made with the development of the KldB 2010 (cp. Geis, Hoffmeyer-Zlotnik 2001; ILO 2012).

4.2 Conversion from the KldB 2010 to the Occupational Order (3-digit code) of the KldB 88

With the KldB 2010, a breach with the previous classifications of occupations was deliberately accepted. The KldB 2010 is based on a different understanding of occupation and uses other criteria for defining the similarity and relatedness of occupational activities and occupations. This makes the development of a high-quality conversion table all the more difficult. But in order to allow consistent time series representations or the comparison with other data sources, a first, preliminary focus converter has been developed. Since the compatibility with the occupational classes (4-digit) of the KldB 88 is so low and a majority of the previous occupation information exists as occupational order (3-digit), a conversion between the Occupational Type (5-digit code) of the KldB 2010 and the occupational order (3-digit) of the KldB 88 is being developed.

A sound conversion table from the Occupational type (5-digit code) of the KldB 2010 to the occupational order (3-digit) of the KldB 88 is still in the works. Additional analyses are required to allocate an occupational order in the sense of a focus (n:1) to each Occupational type and besides to be able to accurately report the potential alternatives. A final conversion table is expected to be published in early 2014.

5 Conclusion

The Classification of Occupations 2010 (KldB 2010) developed by the Federal Employment Agency (BA) is a new systematisation of occupational activities structured as hierarchical classification with five breakdown levels and grouping occupations according to their occupational expertise (defined by the similarity of the activities, knowledge and skills characterising them) and their Requirement Level (defined by the complexity of the activities to be performed).

The implementation of the KldB 2010 supersedes the previous, but obsolete national classifications of occupations. It entails the following advantages:

- a) The occupational expertise structure of the KldB 2010 is not based on deductively gained expert knowledge like the former German classifications of occupations, but is founded on an empirical classification procedure of systematically maintained occupational information the result of which has been verified repeatedly from a career point of view.
- b) The multidimensionality that distinguishes an occupation becomes directly evident in the structure of the KldB 2010. Since from the outset the concept draws a distinction between the two dimensions of occupational expertise (first to 4th digit of the KldB 2010) and the Requirement Level (5th digit of the KldB 2010), a detailed analysis of the two aspects is enabled by looking at the respective digits separately.
- c) The KldB 2010 allows a consistent distinction by skilled labour, supervisors and executives. Within the occupational classification of the Occupational Sub-Group (4-digit code), supervisors and executives can be clearly set apart from their skilled workers.
- d) Through the completely new systematisation of occupational activities, the KldB 2010 enables a contemporary mapping of current occupational patterns. Fields of occupation that have gained in significance in today's working world can thus be adequately mapped.
- e) In the development of the KldB 2010, every effort has been made to ensure that the classification units provide a uniform degree of differentiation across all occupations and that the level of similarity within a unit is comparable to the other units on the same level. This should provide a better empirical basis for occupational mobility analyses.
- f) The KldB 2010 features a high connectivity to the international classification of occupations – the International Standard Classification of Occupations of 2008 (ISCO 08) – and thus contributes to an enormous improvement of the international comparability of occupation information in future national statistics and surveys.

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