

# XML Clearinghouse Report

## 8

### Recruitment

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und Forschung



# Recruitment

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# **I Abstract**

This document describes the current and target states of the online recruitment processes. The first chapter explains how the online job search and recruitment process work today. To maintain an overview of all websites and online portals of procurement and recruiting is a formidable task while visiting every one of job exchange sites would be next to impossible. Thus, the first part of the paper will discuss the workings of a small number of these portals and attempt to identify a general approach to the job search procedure and job procurement. The second chapter describes how the recruitment processes could be supported by Semantic Web technologies. The current business processes and technologies associated with the phases of recruitment processes are tested for potential benefits gained by the applications of Semantic Web technologies. The last chapter describes the common standards and classifications of occupation, competence and economic activities. On some of them our later research will be based.

## II Current state

This part of the document will explain how online job search and recruitment process work today. There are as many ways to post a job offer on the Web as there are places where an applicant can look for a job. There are websites and online portals financed by publishing fees, business websites and a portal set up by the state job centre.

### 1. General information

There is an increasing body of evidence to demonstrate the importance of investment in human capital for economic development. Although most businesses rely on recruiting channels such as newspaper advertisements, online job exchange services, trade fairs, co-worker recommendations and human resources advisors, online personnel marketing is increasingly used with cost cutting results and efficacy. The application process is facilitated by intelligent IT solutions that expedite the recruitment procedure. In the last years the Internet has evolved into the main avenue for recruitment and employment agencies. According to current prognoses over half of future employment procurement will occur online.

As it already has been mentioned there are many various web sites and online job portals. To maintain an overview of all these portals is a formidable task while visiting every one of job exchange sites would be next to impossible. This part of the paper will discuss the workings of a small number of these portals and attempt to identify a general approach to the job search procedure and job procurement. This part of the inquiry will concentrate on questions such as:

- What are the existing kinds of portals?
- How do they work?
- Who pays for the job advertisements?
- Who are these adverts aimed at?

Most procurement and recruiting portals consist of two main parts, one for job seekers and the other the employers, each group posts and monitors its own information on the web pages.

#### 1.1 Job seeker

The aim of this part of the portal is, of course, the search process. However most of today's portals also provide a whole array of services for its users. The user can register his data (application data such as CVs/resumes, school transcripts, qualification degrees) to be used in creating their profiles. The profiles may (though not necessarily so) be made available to employers who are doing online searches for staff.

#### 1.2 Employer

In this part of the web site the employer can search not only for suitable candidates among the profiles on file but also post job offers. Some portals allow both the applicants and employers to include their profiles.

### 2. Different portals

Portals vary in the range of services they provide. For example, there are websites specializing in temporary employment, recruitment agencies offering management level positions or jobs in specific sectors like computing, finance or state-run portals like that of the Federal Employment Office. Other portals, in contrast, are outfitted very simply like *Monster.de*[1] which does not provide search refinement. The job hunter gives in information for region (where?), industrial sector (what?), time (how?) and relevant keywords. Due to the generality of the data submitted the search result

is rather rough. Such portals deliver up a large amount of offerings, everything that matches with the criteria provided, which the job seeker needs to comb through.

## **2.1 Federal Employment Office (Bundesanstalt für Arbeit)**

The first type of portal to be analyzed is the Federal Employment Office (B.A.)'s portal – Arbeitsamt. The B.A. has been offering internet-supported procurement over the own website since 1997 [2]. This agency is one of the largest job exchanges on the Web in Germany and is available free to all users. The website offers a variety of services. In the course of researching this paper the Federal Employment Office replaced its website with a new portal for employers, job seekers and other relevant parties [3].

Basic functionalities of this portal cover the electronic job exchanges with job ad and applicant profiles, several search mechanisms to the precise alignment of supply and demand, applications to the case and integration management for the mediators of the BA, and the integration of job market partners into the central job/applicant data base. Most of the functions offered in the new portal are in effect with a small number being readied in the next months. The current functions are: user registration and user account set-up, messaging service, favourite lists and options for the posting, treatment and deletion of applicants or positions on offer. Portal overlapping functions are tutorials, online assistance and exhaustive search, and mediation functions between job seekers and prospective employers.

**Job Position Seeker (JPS)** – Portal functions for employment include the matching up of job and applicant as well as the posting of company profiles and contact information. Also possible are requests for multiple applicants with similar profiles for one position. A user is required to register in order to gain full use of the portal's service. The "master data" (e.g. name, address, birthday, place of birth), user name and password are requested.

Job seekers have a choice of search options: detail search, quick search and reference number search (see IV6.2). With 'quick search' the user can do a direct search without the need to register. A detailed search can follow up to narrow down the inquiry. The user can narrow down the process further by providing concrete specifications.

The job seeker can also enter her/his profile into the database, which becomes available to prospective employers. The following data are required:

- personal and demographic specification of the applicant (offer)
- applicant information, e.g. personal records, qualifications and CVs/resumes (offer)
- terms, conditions and specifications of the application (demand)

**Job Position Posting (JPP)** – Companies and applicants can post profiles and include information on occupation, salary and requirements.

- details of the firm (offer)
- detailed job description (offer)
- specification of the candidate desired (demand)

The employer or organisation, as same as an applicant, has a choice of among three search options: detail search, quick search and reference number search. If the employer has an exact idea of what s/he is looking for, a detail search can be conducted.

There is also a function to further narrow down the search: the system scans the pages of the website [arbeitsagentur.de](http://arbeitsagentur.de) using the details submitted including relating synonyms.

**BERUFEnet** - is a database for training and job descriptions which provides information with up to 100 areas per occupation structured in a set pattern, with cross references to other information systems (job seeker and placement exchanges, education databases, legal sources, addresses and further sources) and additional targeted information.

**Cooperation** - One of the core concerns of this virtual job market is to provide a vacancy and applicant information exchange with external partners such as employers, job exchanges and other relevant agencies. This portal aims to create greater visibility to the job market (applicant and employment offers) by cross-linking employment offers from private job exchanges, state employment agencies and medium-sized businesses to provide a highly efficient balance of supply and demand. This necessitates a common "language" to facilitate communication between two different software systems. To this end, the HR-BA-XML (see IV7.2) standard, an extension of the HR-XML Standard (see IV7.1), was developed. The exchanged data records contain for example the kind of the offer or the inquired competence.

## 2.2 Jobpilot

Jobpilot.de (net) [4] is a European online career market. Jobpilot posts employment openings, CVs or resumes, business profiles, recruitment announcements and offers a selective access option. Apart from the posting of job advertisements Jobpilot provides an exhaustive range of services like online content analysis and career coaching as well as news and tips regarding occupation and career, community and a chat-room. Most of the services are available free of charge to job seekers while employers may purchase ad spaces. This portal provides:

- a dedicated employment market for research and teachings
- a job column for college or university graduates for entrance positions and openings arranged according to the level of professional experience
- full text search for all employment opportunities
- an overview of firms and their profiles
- free CV/resume help
- weekly job info updates, delivered via e-mail messaging if desired
- precise search: vocational fields, industry sectors, regions and time periods

An online search in this portal involves two steps: first a general inquiry followed by a detailed one. In the general search the user defines: type of employment, global region and language. This information will be used as the basis for a detailed search in which the particularities of the job desired can be defined. The user provides:

- specification of positions seeker
- vocational or industrial sector
- specification of region

A list of suitable openings is given at the end of the search.

## 2.3 National Labour Market Board (Sweden)

In 1995 the National Labour Market Board (A.M.S.) introduced its first Internet service – the Vacancy Bank [5]. Since then they have extended their variety of services on offers. Today employers and job seekers can post and monitor their data on the website, as well as interact with each other directly without the need for intervention of the A.M.S.

The project of a new web site was launched last year to establish an XML-based standard for job vacancy and CV publication in the Swedish market. In regards to the HR-XML Sweden Project (HR-XML-SE see IV7.2), with the support of large firms,

staffing agencies and job brokers, A.M.S. has undertaken the initiative towards developing a standard set of vocabulary for job and candidate postings. The Swedish project is, like its German counterpart *arbeitsagentur.de*, based on an expanded HR-XML.

The A.M.S. has also developed a national standard vocabulary for the classification of occupations and qualifications based on the I.S.C.O. (International Standard Classification of Occupations – see IV1.3) and Job Profiles System currently in use by the A.M.S. and EURES (see 2.4).

## **2.4 EURES - European Job Mobility Portal**

EURES [6] brings together the European Commission and the public employment services of the countries of the European Economic zone and Switzerland along with other regional and national bodies concerned with employment issues, such as trade unions, employers' organisations, as well as local and regional authorities.

EURES targets both job seekers interested in moving to another country to work or study, and employers wishing to recruit from abroad. It is an online gateway to information on living and working conditions, labour market situations and job vacancies within the European Union's member states. It gives those looking for jobs the opportunity to post their CVs online. Full access to the CVs on file is available to EURES advisers and registered employers. Certain general CV data (occupation, education and age) can also be viewed by non-registered users. The vacancies available at EURES Job Search cover a wide range of occupations and include permanent and seasonal opportunities. Job seekers may select, for example, a country, region, profession, type of contract or combine several criteria to find a job.

This portal also provides information on education and training throughout the EU, highlighting the Commission's commitment to lifelong learning and skills development.

In the advisory section EURES has a network of 500 advisers Europe-wide to personally answer inquiries submitted by job seekers and employers.

To access EURES' CV search, a firm must be based in one of the 17 member countries of the European Economic Area (E.E.A.) or Switzerland and have a valid VAT number. Enterprises not eligible for a VAT number need to contact the help desk to request access to the service. Registered firms are entitled to the services that EURES offers free to job applicants. Employers who wish to post a vacancy on EURES may turn to the local employment office or the nearest EURES adviser for assistance.

EURES is a free service available to both job seekers and employers.

## **3. Services – Overview**

### **3.1 Search**

Search function is the most important function of the online recruitment portal. Most portals offer two search options: position openings and hiring. Within each option are two subtypes: quick and detail search.

### **3.2 Profiling / Job Agent**

Some portals also offer a so-called job agent (like in [7] called *My jobpilot*). After registration the user arrives at the personal starting page to store the search criteria in a personal search profile.

The job agent will on a regular basis, e.g. every 3, 7 or 14 days, scan new position openings, check them against the user's criteria and notify the user of suitable positions by e-mail.

### **3.3 CV publishing**

A curriculum vitae or resume can be posted on the Web free of charge. This is done by firms with whom the person has direct contact or over the message box like on the Jobpilot [4]. The CV data is posted anonymously and the user retains the right to decide who will get the access to the complete CV.

The problem lies in the fact that job seekers register their CVs at a number of job portals and company websites. They subsequently lose track of where their resumes are posted and thus cannot keep them regularly updated.

### **3.4 Job-Robot-Technology**

The mediators of the Federal Employment Office (BA mediators) receive with the Job-Robot-Technology entrance to employments offered, which were so far not announced to the labour offices. This tool serves as the better overview of vacancy and by the BA's broker is used for the submission of proposals.

The job robot scans daily sides of enterprises, guilds and federations only the job offers of job stock exchanges and daily papers are not scanned. If the job robot finds something new, the employment offered is transferred to a list. The search occurs after the characteristics job title, name of the enterprise, kind of the employment (i.e. full time or part time), topicality as well as geographical proximity [8].

## **III Target State**

This part of the document describes how recruitment processes could be supported by the new technology - Semantic Web. For this it confronts a usual recruitment process it is found today in many organizations with a potential future process, describing changes in the technologies used, changes in the business models of the participants and potential overall economic advantages.

### **1. General information**

Reliable information regarding the availability of employment opportunities, qualifications and individual procurement capability figure vitally for effective employment procurement. Due to the employment and consultation market's vast array of suppliers, services and channels on the Internet visibility is rather limited. As already said a comprehensive view of all the job openings and job seekers on offer is impossible. At present the meta-search engines available conduct searches on a full text basis and as a result are limited in their ability to provide offers that match the precise needs of their clients.

In the first part of this document was said the Internet has enhanced the transparency of the labour market which in turn has improved the quality of individual labour market decisions. Employers, job seekers and administrators now have easy access to almost all information available. On the other hand, market mismatches due to the lack of adequate information should be minimised. There is a certain extend room for improvement.

### **2. Recruitment**

From an organisation's point of view, a usual recruitment process can be divided into the following phases:

- an operating department is defining the requirement for an open position and is writing a job posting
- the staff department is publishing the job posting
- the staff department is receiving job applications and is pre-selecting a set of applications it passed to the operating department

- after interviewing some candidates, the staff- and operating department are deciding together who is getting the job.

The current business processes and technologies associated with this four phases are described in more detail in the following and are tested for potential benefits gained by the applications of Semantic Web technologies. The developed scenario is using Semantic Web technologies to a maximal extend. For real situations even partial realizations of the scenario could already provide benefits.

## 2.1 Writing of a job posting

**Situation today** – Nowadays job postings are written in the form of free text using uncontrolled vocabularies. They are usually structured into the following parts: Organisation description, job description, skills and qualifications required and contact information.

**Potential uses of semantic technologies** – In addition to the free text describing a job posting the following information could be represented as RDF using controlled vocabularies in the form of taxonomies: job type, skills and qualifications required, contract details, parts of the description of the organisation, locations.

**Potential advantages and problems** – The use of concepts for describing jobs makes the descriptions language independent. The additional effort for writing semantic descriptions could be a problem. And the higher machine processability of semantically described postings will be an advantage in the later phases of the process.

**Necessary technological components** – The first needed parts are vocabularies for describing jobs, organisations, contracts and applications details and taxonomies for describing job types, skills and qualifications. Furthermore, the users also need easy to use editors for writing semantic job descriptions and beside this the interfaces to common HR-software to export semantic job descriptions has to be developed.

## 2.2 Publishing of a job posting

**Situation today** – Today there are three mayor ways for publishing job postings:

- newspapers which are precise but relatively expensive and reach only restricted group of recipients;
- online job portals which are also relatively expensive but reach bigger group of recipients; online job portals are gaining market share from newspapers; They are financed by high publishing fees (up to 500 € per posting);
- web site of the organization which are inexpensive but being read only by small group of recipients due to low exposure trough WWW search engines.

Today there are various existing taxonomies for the classification of job posting (see BKZ IV1.2, International Standard Classification of Occupations IV1.5) and some XML standardisation efforts defining data exchange formats (HR-XML). There are also some efforts by the German Federal Employment Office (B.A.) to build an integrated job database. It is planned to fill the database with offers sent in by employers in the HR-BA-XML format and by crawling company's websites for job postings.

**Potential uses of semantic technologies** – Organisations looking for employees are interested in reaching as many potential applicants as possible. They would benefit from publishing a job posting as RDF data on their website and having it crawled by all job portals. By crawling the postings, the classical closed 1:n communication links between an organisation and a fixed set of job portals would change into open n:m communication. Market transparency would rise because all job postings would be accessible trough all portals. The RDF descriptions of open positions could be matched with the profiles of applicants using background knowledge represented in rich ontologies (similar job types, skills needed for a job type, education, city). Job portals

could calculate the similarity of a posting and a profile and could recommend jobs to applicants or applicants to companies.

**Potential advantages and problems** – Employers and applicants benefit from the higher market transparency. Employers cut their publishing costs close to zero and applicants do not have to visit so many web pages any more. Besides the multilingualism of concept-based descriptions simplifies the global exchange of postings. Furthermore semantic annotations would simplify the crawling of websites for jobs postings, compared to the current approach by the A.B.

The new technology, as it could be expected, brings not only the advantages but causes also some problems. For example the job portals would have to change their business models from taking fees from the employers to taking fees for matchmaking from the applicants or to revenue from advertisements on their sites. Various portals could be distinguishable by the sector specific background knowledge, they are using in the matchmaking process.

**Necessary technological components** – The obvious required technology component would be crawlers for collecting the job postings and semantic portals for matchmaking and browsing these postings.

## 2.3 Receiving and pre-selecting job applications

**Situation today** – There are two mayor channels through which organizations are receiving applications:

- paper applications by classical mail which cause high handling costs and are not suitable for automatic pre-selecting; proofs of experience and education are attached to applications as paper;
- online applications through forms on the company's website which compare with paper applications, do not cause high handling costs and offer higher suitability for automatic pre-selecting; proofs of experience and education are attached to applications as scanned-in paper testimonials.

Due to the increased number of applications employers are pushing online applications because they want to save handling costs and be able to pre-select applications easier.

**Potential uses of semantic technologies** – Even application data enter into a database through web forms is not really suitable for the automatic pre-selection of candidates, because of the uncontrolled terminology used. In addition to free-text semantic web applications could contain RDF data describing an applicant using controlled vocabularies. The use of such vocabularies in job applications for describing skills, experiences or/and education level would allow better automatic matchmaking between requirements and applications. Knowledge represented in rich ontologies could be used in the matchmaking process. Furthermore, proofs of experience and education could be attached to applications in the form of RDF statements, digitally signed by the issuing university or organization.

**Potential advantages and problems** – For an applicant it is more convenient to create an RDF description and sent it to different employers, then manually filling web forms on different employer's websites. So RDF facilitates the reuse of application data. Additionally, employers could save costs by the automatic pre-selection of applications. The verification of proofs of experience and education would be more secure by using digital signatures.

The main disadvantages are facts that applicants would have to add RDF descriptions to their application and educational institutions or public notary services would have to issue signed testimonials using RDF.

**Necessary technological components** – The concepts presented above require editors for enriching job applications with semantic descriptions using a set of

controlled vocabularies and taxonomies and tools for checking proofs and matchmaking between applications and requirements.

## 2.4 Final recruitment decision

The final decision between the pre-selected applications is done manually today and will also be done manually in the future.

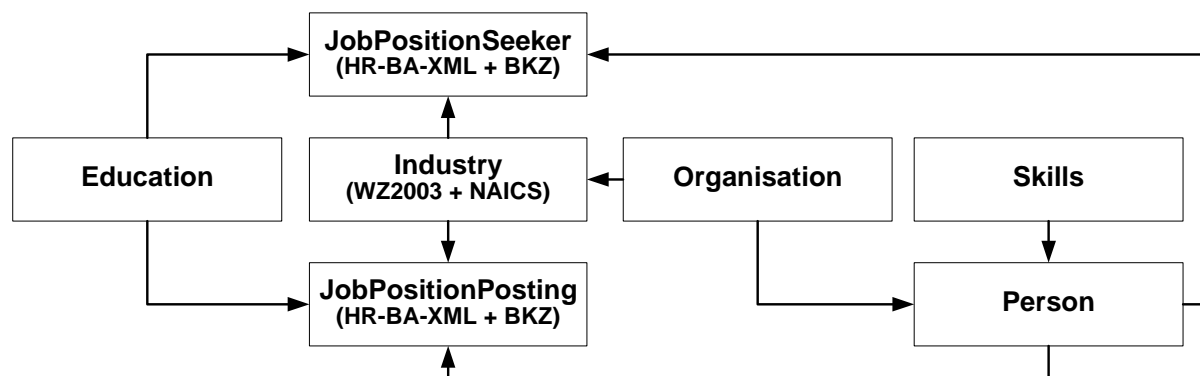
## 3. First step

The last subchapters describe how recruitment processes could be supported by Semantic Web technologies. This part of the document presents the first step in the development of a Semantic Web based scenario.

### 3.1 General information

We build an ontology for recruitment based on JobPositionSeeker and JobPositionPosting from HR-BA-XML. The concept is also based on some classifications and standards we have selected. The detailed description of the classifications and standards can be found in the next chapter. In the ontology for recruitment we used:

- Job Code (BKZ Berufskennziffer, see IV1.2)
- Training Job Code (ASIS\_BKZ\_(Frau/Mann) – Berufskennziffer – Ausbildung)
- Classification of Industry Sector (WZ2003 – Klassifikation der Wirtschaftszweige, Ausgabe 2003, see IV4.2)
- NAICS – North American Industry Classification System, version used in the United States of America (see IV4.4)
- Skills ontology – Project KOWIEN (see [15])
- HR-XML (see IV7.1) and especially XR-BA-XML (see IV7.2)



### 3.2 Potential side effects

**Other applications** – The published job offers and company descriptions could be used by other applications for creating yellow pages or labour market statistics. Furthermore the technological and role concept of the scenario could be transferred to call-for-tenders procedures.

**Decentral data publication** – In our future scenario data can be published decentral and crawled by all parties interested in the data. As a result there will be no need for a central market-maker like the B.A. database and all interested parties could have unrestricted access to all published data.

**Semantically precise descriptions** – In addition to approaches like HR-XML which is mainly defining data exchange message standards, we would try to offer a set of message content standards in the form of taxonomies. The combination of message

and content standards leads to semantically precise descriptions that allow automating matchmaking.

## IV Classification & Standards

This chapter describes the common standards and classifications of occupation, competence and economic activities. Some standards are designed as an instrument suitable for assembling, compiling, and presenting statistics of education and training both within individual countries and internationally, some other for studying economic phenomena, fostering international comparability of data and for promoting the development of sound national statistical systems.

The national and international types of classifications are used for example by federal agencies for education and training statistics. The international standards should also facilitate international communication.

### 1. Occupation Classifications

#### 1.1 Standard Occupational Classification (SOC) System

FULL TITLE	<b>Standard Occupational Classification (SOC) System</b>
ABBREVIATION	<b>SOC</b>
ORIGINATING AUTHORITY	U.S. Department of Labor - Bureau of Labor Statistics
WWW ADDRESS	Homepage: <a href="http://www.bls.gov/soc/">http://www.bls.gov/soc/</a> SOC Major Groups: <a href="http://www.bls.gov/soc/soc_majo.htm">http://www.bls.gov/soc/soc_majo.htm</a>
CURRENT STATUS	Operational
AMENDMENT DATES	June 1999
STRUCTURE	6 digits number system Level 1: 23 major groups Level 2: 96 minor groups Level 3: 449 broad occupations Level 4: 820 detailed occupations
SUCCINCT DESCRIPTION	The Standard Occupational Classification (SOC) system will be used by all Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of over 820 occupations according to their occupational definition. To facilitate classification, occupations are combined to form 23 major groups, 96 minor groups, and 449 broad occupations. Each broad occupation includes detailed occupation(s) requiring similar job duties, skills, education, or experience.
USAGE	all U.S. Federal statistical agencies
MEDIA THROUGH WHICH AVAILAB	Hardcopy , WWW

LANGUAGES English;  
 Bureau of Labor Statistics  
 ADDRESS OF RESPONSIBLE AGENT Division of Information Services  
 2 Massachusetts Avenue, N.E. Room 2860  
 Washington, D. C. 20212  
<http://www.bls.gov/pub/opub/opbinfo.htm>

## 1.2 Berufskennziffern System (BKZ)

FULL TITLE **Berufskennziffern System**

ABBREVIATION **BKZ**

ORIGINATING AUTHORITY Bundesanstalt für Arbeit, Germany  
<http://www.arbeitsamt.de> , <http://berufenet.arbeitsamt.de>  
 BKZ-List (ordered by numbers):  
[http://www.arbeitsamt.de/hst/markt/news/BKZ\\_num.txt](http://www.arbeitsamt.de/hst/markt/news/BKZ_num.txt)  
 BKZ-List (ordered by occupation)  
[http://www.arbeitsamt.de/hst/markt/news/BKZ\\_alpha.txt](http://www.arbeitsamt.de/hst/markt/news/BKZ_alpha.txt)

WWW ADDRESS BKZ-Occupation groups  
[http://www.arbeitsamt.de/hst/markt/news/BKZ\\_grp.txt](http://www.arbeitsamt.de/hst/markt/news/BKZ_grp.txt)  
 BKZ-apprenticeships (female)  
[http://www.arbeitsamt.de/BKZ/ASIS\\_BKZ\\_Frau.txt](http://www.arbeitsamt.de/BKZ/ASIS_BKZ_Frau.txt)  
 BKZ-apprenticeships (male)  
[http://www.arbeitsamt.de/BKZ/ASIS\\_BKZ\\_Mann.txt](http://www.arbeitsamt.de/BKZ/ASIS_BKZ_Mann.txt)

CURRENT STATUS Operational

AMENDMENT DATES 16.10.2002

STRUCTURE 7 digits number system  
 Level 1: 326 occupation groups (first 3 digits)  
 Level 2: 5597 occupations

SUCCINCT DESCRIPTION The System of "Berufskennziffern" (BKZ) system is used by all Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of 5597 occupations according to their occupational definition. Each single occupation is assigned to one of the 326 occupation groups. The BKZ is also be used in the federal "berufenet.arbeitsamt.de"-Web-Site. This Site provides detailed information about activities, apprenticeship, contact-information, and hard facts about nearly each occupation.

USAGE Bundesanstalt für Arbeit, Berufenet.de, Job-Portals

MEDIA WWW

THROUGH  
WHICH  
AVAILAB

LANGUAGES German

ADDRESS OF RESPONSIBLE AGENT Regensburger Straße 104, 90478 Nürnberg, Germany  
Tel (+49)(0911) 179-0, Fax (+49) (0911) 179-2123

### 1.3 International Standard Classification of Occupations

FULL TITLE	<b>International Standard Classification of Occupations, 1988 version</b>
ABBREVIATION	<b>ISCO-88</b>
ORIGINATING AUTHORITY	International Labour Organization (ILO)
LEGAL BASIS	Adopted as Resolution III (Resolution concerning the revision of the International Standard Classification of Occupations) by the Fourteenth International Conference of Labour Statisticians (November 6, 1987).
CURRENT STATUS	Operational
AMENDMENT DATES	First issued in 1958; revised in 1968 (ISCO-68).
STRUCTURE	Level 1: 10 major groups; Level 2: 28 sub-major groups; Level 3: 116 minor groups; Level 4: 390 unit groups.
SUCCINCT DESCRIPTION	The framework necessary for designing and constructing ISCO-88 has been based on two main concepts: the concept of the kind of work performed or "job", and the concept of "skill". "Job" - defined as a set of tasks and duties executed, or meant to be executed, by one person - is the statistical unit classified by ISCO-88. A set of jobs whose main tasks and duties are characterised by a high degree of similarity constitutes an occupation. Persons are classified by occupation through their relationship to a past, present or future job. "Skill" - defined as the ability to carry out the tasks and duties of a given job - has, for the purposes of ISCO-88, two dimensions: 1) "Skill level" - which is a function of the complexity and range of the tasks and duties involved, and 2) "Skill specialisation" - defined by the field of knowledge required, the tools and machinery used, the materials worked on or with, as well as the kinds of goods and services produced (Source: Introduction to ISCO-88).
USAGE	Occupations
MAIN STATISTICAL APPLICATION	ISCO is intended to facilitate international communication on the subject of occupations and occupational groups.
MEDIA THROUGH WHICH AVAILAB	Hardcopy and electronic copy: from the under mentioned responsible agency; RAMON: Eurostat's classifications server.

	Link to classification
LANGUAGES	English; French; Russian; Spanish.
ADDRESS OF RESPONSIBLE AGENT	International Labour Organization Bureau of Statistics Mr. Eivind Hoffmann 4, Route des Morillons CH-1211 Geneva 22 Switzerland Tel.: (41-22) 799-8076 Fax: (41-22) 799-6957 E-Mail: hoffmann@ilo.org

#### 1.4 International Standard Classification of Occupations (for European Union purposes)

FULL TITLE	<b>International Standard Classification of Occupations (for European Union purposes), 1988 version</b>
ABBREVIATION	<b>ISCO-88(COM)</b>
WWW ADDRESS	<a href="http://www.warwick.ac.uk/ier/isco/brit/grplist.html">http://www.warwick.ac.uk/ier/isco/brit/grplist.html</a> Groups in PDF-format (German) A Guide for Users: <a href="http://www.csv.warwick.ac.uk/ier/isco/brit/intro.htm">http://www.csv.warwick.ac.uk/ier/isco/brit/intro.htm</a>
ORIGINATING AUTHORITY	Commission of the European Communities (Statistical Office/Eurostat)
CURRENT STATUS	Operational
SUCCINCT DESCRIPTION	ISCO-88(COM) is the European Union variant of the International Standard Classification of Occupations (ISCO-88; see this entry). ISCO-88(COM) should not be regarded as a different classification from ISCO-88, but rather it is the result of a coordinated effort to implement ISCO-88 for census and survey coding purposes.
USAGE	Occupations
MEDIA THROUGH WHICH AVAILAB	RAMON: Eurostat's classifications server. Link to classification
LANGUAGES	English; French; German.
ADDRESS OF RESPONSIBLE AGENT	Statistical Office of the European Communities (Eurostat) Mr Hubert Charlier Bâtiment BECH D4/733 L-2920 Luxembourg Tel.: +352 4301 32974 E-mail: hubert.charlier@cec.eu.int

## 1.5 International Standard Classification of Status in Employment

FULL TITLE	<b>International Standard Classification of Status in Employment</b>
ABBREVIATION	<b>ICSE-93</b>
WWW ADDRESS	<a href="http://www.ilo.org/public/english/120stat/res/icse.htm">http://www.ilo.org/public/english/120stat/res/icse.htm</a>
ORIGINATING AUTHORITY	International Labour Organization (ILO)
LEGAL BASIS	Resolution concerning the International Classification of Status in Employment adopted by the Fifteenth International Conference of Labour Statisticians (January 1993).
CURRENT STATUS	Operational
IMPLEMENTATION DATE	1993
STRUCTURE	Six groups identified by one-digit numerical codes.
SUCCINCT DESCRIPTION	The ICSE classifies jobs held by persons at a point in time. A job is classified with respect to the type of explicit or implicit contract of employment of the person with other persons or organizations. The basic criteria used to define the groups of the classification are the type of economic risk, an element of which is the strength of the attachment between the person and the job, and the type of authority over establishments and other workers which the job incumbents have or will have.
USAGE	Occupations
MAIN STATISTICAL APPLICATION	Labour statistics
MEDIA THROUGH WHICH AVAILAB	Hardcopy and electronic copy: from the under mentioned responsible agency; RAMON: Eurostat's classifications server.
LANGUAGES	English
ADDRESS OF RESPONSIBLE AGENT	International Labour Organization Bureau of Statistics 4, Route des Morillons CH-1211 Geneva 22 Switzerland Tel.: +41 22 799 8631 Fax: +41 22 799 6957 E-mail: <a href="mailto:stat@org.ilo">stat@org.ilo</a>

## 2. Apprenticeship classifications

### 2.1 Classification of Fields of Training

FULL TITLE	<b>Classification of Fields of Training</b>
ORIGINATING	European Centre for the Development of Vocational Training

AUTHORITY	(CEDEFOP) and Statistical Office of the European Communities (Eurostat)
LEGAL BASIS	None
CURRENT STATUS	Operational
IMPLEMENTATION DATE	1998
LIMIT OF OPERATIONAL LIFE	None
WWW ADDRESS	Link to Classification of Fields of Training
STRUCTURE	Level 1: 10 broad fields identified by one-digit numerical codes; Level 2: 26 fields of education identified by two-digit numerical codes; Level 3: 63 fields of training identified by three-digit numerical codes.
SUCCINCT DESCRIPTION	Sub-classification to the International Standard Classification of Education (ISCED-97) by field of education which has been created with the double objective of providing more detail and precision for the purpose of collecting policy-relevant data on fields of vocational education and training, while simultaneously maintaining the logic and structure of ISCED.
LINKED CLASSIFICATIONS	ISCED 1997
USAGE	Education
MAIN STATISTICAL APPLICATION	Education and training statistics
MEDIA THROUGH WHICH AVAILABLE	Hardcopy and electronic copy: from the under mentioned responsible agencies; RAMON: Eurostat's classifications server.
LANGUAGES	English, French; German.
ADDRESS OF RESPONSIBLE AGENT	European Centre for the Development of Vocational Training (CEDEFOP) Mrs Pascaline Descy P.O. Box 27-Finikas GR - 55102 THESSALONIKI  Statistical Office of the European Communities (Eurostat) Mr Spyridon Pilos (Unit E3) Bâtiment BECH D2/722 L-2920 Luxembourg Tel. : + 352 4301 32011/34206 - Fax : + 352 4301 34415 E-mail: spyridon.pilos@cec.eu.int

## 2.2 International Standard Classification of Education

FULL TITLE	<b>International Standard Classification of Education, 1997</b>
ABBREVIATION	<b>ISCED 1997</b>

	<a href="http://unesco-stat.unesco.org/en/pub/pub_p/method.htm">http://unesco-stat.unesco.org/en/pub/pub_p/method.htm</a>
WWW ADDRESS	<a href="http://www.uis.unesco.org/en/pub/pub_p/method.htm">http://www.uis.unesco.org/en/pub/pub_p/method.htm</a> <a href="http://www.uis.unesco.org/en/pub/isced/ISCED_A.pdf">http://www.uis.unesco.org/en/pub/isced/ISCED_A.pdf</a>
ORIGINATING AUTHORITY	United Nations Educational Scientific and Cultural Organization (UNESCO)
LEGAL BASIS	ISCED 1997 was approved by the UNESCO General Conference at its 29th session in November 1997.
CURRENT STATUS	Operational
IMPLEMENTATION DATE	1998
PREDECESSOR CLASSIFICATION	ISCED 1976 (see this entry).
STRUCTURE	Level 1: 7 levels of education; Level 2: 10 broad groups of education; Level 3: 25 fields of education.
SUCCINCT DESCRIPTION	ISCED provides an integrated and consistent statistical framework for the collection and reporting of internationally comparable education statistics. It contains two components: - a statistical framework for the comprehensive statistical description of national education and learning systems along a set of variables that are of key interest to policy makers in international educational comparisons; and - a methodology that translates national educational programmes into an internationally comparable set of categories for (i) the levels of education; and (ii) the fields of education. ISCED rests on three components: (i) internationally agreed concepts and definitions, (ii) the classification systems, and (iii) an operational instructional manual and a well-defined implementation process.
	The basic unit of classification in ISCED remains the educational programme. Educational programmes are defined on the basis of their educational content as an array or sequence of educational activities which are organized to accomplish a pre-determined objective or a specified set of educational tasks.
USAGE	Education
MAIN STATISTICAL APPLICATION	The International Standard Classification of Education has been designed as an instrument suitable for assembling, compiling, and presenting statistics of education both within individual countries and internationally. It is expected to facilitate international compilation and comparison of education statistics.
MEDIA THROUGH WHICH AVAILABLE	Hardcopy and electronic copy: from the under mentioned responsible agency
LANGUAGES	English, French, Spanish and Russian.
ADDRESS OF RESPONSIBLE AGENT	UNESCO 7 Place de Fontenoy 75352 Paris 07 SP FRANCE

e-mail: [statistics@unesco.org](mailto:statistics@unesco.org)

REMARKS Further and very detailed information can be found in the introduction to the classification that can be consulted on the Internet at the following address:  
<http://unescostat.unesco.org/Documents/iscid.asp>.

### 3. Competence classification

#### 3.1 Neue Ausbildungsberufe 1999-2001

FULL TITLE	<b>Neue Ausbildungsberufe 1999-2001</b>
WWW ADDRESS	<a href="http://www.neue-ausbildungsberufe.de">http://www.neue-ausbildungsberufe.de</a>
ORIGINATING AUTHORITY	BIBB - Bundesinstitut für Berufsbildung, Germany
CURRENT STATUS	Operational
IMPLEMENTATION DATE	1999
STRUCTURE	66 new introduced occupations are explained. Each occupation description contains information about the area of operation and a list of skills, that are needed to fulfil the job demands, and which skills are taught in a vocational-training.
USAGE	Information
MEDIA THROUGH WHICH AVAILAB	WWW in free text
LANGUAGES	German
ADDRESS OF RESPONSIBLE AGENT	BIBB - Bundesinstitut für Berufsbildung Postfach 201264 53142 Bonn e-mail: <a href="mailto:statistics@unesco.org">statistics@unesco.org</a>

#### 3.2 Berufenet.Arbeitsamt.de

FULL TITLE	<b>Berufenet.Arbeitsamt.de</b>
WWW ADDRESS	<a href="http://Berufenet.Arbeitsamt.de">Berufenet.Arbeitsamt.de</a>
ORIGINATING AUTHORITY	Bundesanstalt für Arbeit
CURRENT STATUS	Operational
IMPLEMENTATION DATE	
STRUCTURE	To all occupations identified by BKZ numbers, there are competency profiles existing, but we didn't manage to access them yet.

USAGE

MEDIA THROUGH WHICH AVAILAB ???

LANGUAGES German

ADDRESS OF RESPONSIBLE AGENT

### 3.3 Employer type classification

FULL TITLE **Employer type classification**

WWW ADDRESS [www.acm.org/sigmod/dbjobs/posting-guide.html](http://www.acm.org/sigmod/dbjobs/posting-guide.html)

ORIGINATING AUTHORITY

CURRENT STATUS Operational

IMPLEMENTATION DATE ???

STRUCTURE

To assist job seekers in their search, job advertisement is required to include classification information regarding the employer. There are six types [10]:

- *academia*- for universities, colleges and institutions of higher learning
- *government* - for government positions that do not fall into any of the other categories. For instance, a position at the US Department of Commerce should be listed under *government*, whereas an opening at a state-funded public university should be listed under *academia*
- *industry* of any type, except in the case of a *research lab* or a *start-up*
- *research lab*- including labs of industrial employers or state institutions
- *start-up*- for new or recently established companies
- *other*- for employers who do not fit into any of the above categories, e.g. non-profit organisations.

USAGE Information

MEDIA THROUGH WHICH AVAILAB WWW in free text

LANGUAGES English

ADDRESS OF RESPONSIBLE AGENT  
Alexandros Labrinidis  
University of Pittsburgh

### 3.4 Classification of employment types

FULL TITLE	<b>Classification of employment types</b>
WWW ADDRESS	<a href="http://www.acm.org/sigmod/dbjobs/posting-guide.html">www.acm.org/sigmod/dbjobs/posting-guide.html</a>
ORIGINATING AUTHORITY	
CURRENT STATUS	Operational
IMPLEMENTATION DATE	???
STRUCTURE	<p>Job advertisements must also include classification information regarding the types of employment. There are five types [10] :</p> <ul style="list-style-type: none"><li>• <i>permanent</i>- for permanent positions, including tenure-track academic positions</li><li>• <i>temporary</i>- short-term positions other than the other categories listed</li><li>• <i>contract</i>- temporary positions created to fulfil a specific task</li><li>• <i>post-doc</i>, short-term research positions such as recently Ph.D. graduates</li><li>• <i>internship</i>- summer positions for students, typically in private industry</li></ul>
USAGE	Information
MEDIA THROUGH WHICH AVAILAB	WWW in free text
LANGUAGES	English
ADDRESS OF RESPONSIBLE AGENT	Alexandros Labrinidis University of Pittsburgh

### 3.5 Position classification

FULL TITLE	<b>Position classification</b>
WWW ADDRESS	<a href="http://www.acm.org/sigmod/dbjobs/posting-guide.html">www.acm.org/sigmod/dbjobs/posting-guide.html</a>
ORIGINATING AUTHORITY	
CURRENT STATUS	Operational
IMPLEMENTATION DATE	???
STRUCTURE	<p>To help job seekers in the search process, job advertisements are required to include classification information for the type of position posted. The task(s) for each position falls into one or more of the following categories [10]: <i>development, management, research, and teaching</i>. For example, an</p>

academic position typically involves *teaching & research*, whereas a position at a research lab usually involves *Research & Development*.

USAGE	Information
MEDIA THROUGH WHICH AVAILAB	WWW in free text
LANGUAGES	English
ADDRESS OF RESPONSIBLE AGENT	Alexandros Labrinidis University of Pittsburgh

## 4. Classification of Economics Activities

### 4.1 International Standard Industrial Classification of All Economic Activities

FULL TITLE	<b>International Standard Industrial Classification of All Economic Activities, Revision 3.1</b>
ABBREVIATION	<b>ISIC Rev. 3.1</b>
ORIGINATING AUTHORITY	United Nations Statistics Division (UNSD)
LEGAL BASIS	Approved by the Statistical Commission of the United Nations in March 2002
CURRENT STATUS	Draft
PREDECESSOR CLASSIFICATION	ISIC Rev.3
STRUCTURE	<p>Level 1 : 17 sections identified by alphabetical letters A to Q;            Level 2 : 62 divisions identified by two-digit numerical codes;            Level 3 : 161 groups identified by three-digit numerical codes;            Level 4 : 298 classes identified by four-digit numerical codes.</p> <p>A standard classification of economic activities arranged so that entities can be classified according to the activity they carry out. The categories of ISIC at the most detailed level (classes) are delineated according to what is, in most countries, the customary combination of activities described in statistical units.</p>
SUCCINCT DESCRIPTION	<p>The groups and divisions, the successively broader levels of classification, combine the statistical units according to the character, technology, organization and financing of production. Wide use has been made of ISIC, both nationally and internationally, in classifying data according to kind of economic activity in the fields of population, production, employment, gross domestic product and other economic activities (Source: United Nations).</p> <p>ISIC is a basic tool for studying economic phenomena, fostering international comparability of data and for promoting</p>

the development of sound national statistical systems.

Thus, despite the word "industrial" in its name, ISIC is not just a classification of industries.

LINKED CLASSIFICATIONS	<ol style="list-style-type: none"><li>1) International Standard Industrial Classification of All Economic Activities, Second Revision (ISIC Rev.3 and Rev.2);</li><li>2) Standard International Trade Classification (SITC Rev.3);</li><li>3) Central Product Classification (CPC Ver.1.1);</li><li>4) Classification of the Functions of Government (COFOG);</li><li>5) Statistical Classification of Economic Activities in the European Community (NACE Rev.1.1);</li><li>6) Statistical Classification of Products by Activity in the European Economic Community (CPA);</li><li>7) Harmonized System (HS);</li><li>8) National activity classifications of EU Member States.</li></ol>
USAGE	Activities
MAIN STATISTICAL APPLICATION	Use in economic, social, health and demographic statistics for data compilation and presentation by kinds-of-activity; national accounts.
MEDIA THROUGH WHICH AVAILABLE	Hardcopy and electronic copy: from the under mentioned responsible agency; WWW: Website of the United Nations Statistics Division (accessible via RAMON)
LANGUAGES	Arabic, Chinese, English, French, Russian, Spanish (in preparation)
ADDRESS OF RESPONSIBLE AGENT	United Nations Statistics Division (UNSD) Statistical Classifications Section 2 UN Plaza New York, NY 10017 United States of America E-mail: chl@un.org
REMARKS	For further information about United Nations classifications, please visit the UN Statistics Division Website at the following WWW address: <a href="http://www.un.org/Depts/unsd/class">http://www.un.org/Depts/unsd/class</a>

Link: <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17&Lg=1>

## 4.2 Classification of industrial sector (Klassifikation der Wirtschaftszweige-WZ2003)

FULL TITLE	<b>Klassifikation der Wirtschaftszweige, Ausgabe 2003 (WZ 2003)</b> <b>(Classification of industry sector)</b>
ABBREVIATION	<b>WZ 2003</b>
ORIGINATING AUTHORITY	Statistische Bundesamt, Wiesbaden, Germany
CURRENT STATUS	Operational

WWW ADDRESS	<a href="http://www.destatis.de/allg/d/klassif/wz2003.htm">http://www.destatis.de/allg/d/klassif/wz2003.htm</a>
PREDECESSOR CLASSIFICATION	WZ 93
STRUCTURE	<p>Level 1 : 17 chapters  Level 2 : 31 sub-chapters  Level 3 : 60 branches  Level 4 : 222 groups</p> <p>Level 5 : 513 classes  Level 6: 1041 sub-classes</p>
SUCCINCT DESCRIPTION	<p>A standard classification of economic activities arranged so that entities can be classified according to the activity they carry out.</p> <p>Statistical Classification of Economic Activities in the European Community (NACE Rev.1.1);</p>
LINKED CLASSIFICATIONS	This classification is also used by the "Virtual-Arbeitsamt (VAM)".
USAGE	Activities
MAIN STATISTICAL APPLICATION	Use in economic, social, health and demographic statistics for data compilation and presentation by kinds-of-activity; national accounts.
MEDIA THROUGH WHICH AVAILABLE	WWW, Hardcopy
LANGUAGES	German
ADDRESS OF RESPONSIBLE AGENT	<p>Gustav-Stresemann Ring 11  65189 Wiesbaden</p> <p>Tel.: +49 (0) 611/75-2405</p> <p>Fax: +49 (0) 611/75-3330</p> <p>E-Mail: <a href="mailto:info@destatis.de">info@destatis.de</a></p>

### 4.3 Statistical Classification of Economic Activities in the European Community

FULL TITLE	<b>Statistical Classification of Economic Activities in the European Community, Rev.1.1</b>
ABBREVIATION	<b>NACE Rev.1.1</b>
ORIGINATING AUTHORITY	Commission of the European Communities (Statistical Office/Eurostat)
WEB ADDRESSES	<a href="http://europa.eu.int/comm/eurostat/ramon/nace_rev1_1/nace_rev1_1_en.html">http://europa.eu.int/comm/eurostat/ramon/nace_rev1_1/nace_rev1_1_en.html</a>
LEGAL BASIS	1. Council of the European Communities Regulation (EEC) No. 3037/90 of 9 October 1990 (Official Journal of the European

	Communities No. L 293, 24.10.1990);
	2. Commission Regulation (EC) No. 29/2002 of 19 December 2001 amending Council Regulation (EEC) No. 3037/90 on the statistical classification of economic activities in the European Community (Official Journal of the European Communities No. L 6, 10.1.2002, p. 3).
IMPLEMENTATION DATE	01.01.2003
LIMIT OF OPERATIONAL LIFE	Revision foreseen for 01.01.2007
PREDECESSOR CLASSIFICATION	NACE Rev. 1
STRUCTURE	<p>Level 1: 17 sections identified by alphabetical letters A to Q; intermediate level: 31 sub-sections identified by two-character alphabetical codes;</p> <p>Level 2: 62 divisions identified by two-digit numerical codes (01 to 99);</p> <p>Level 3: 224 groups identified by three-digit numerical codes (01.1 to 99.0);</p> <p>Level 4: 514 classes identified by four-digit numerical codes (01.11 to 99.00).</p> <p>NACE Rev. 1.1 is the classification of economic activities corresponding to ISIC Rev.3 at European level. Though more disaggregated than ISIC Rev.3.1, NACE Rev.1.1 is totally in line with it and can thus be regarded as its European counterpart.</p>
SUCCINCT DESCRIPTION	<p>Since the national economic structures vary considerably, there are branches of industry in NACE Rev. 1.1 which are not of importance or do not occur in all Member States (e.g. branches of mining and quarrying, manufacture of spacecraft, etc.).</p> <p>The NACE Rev. 1.1 Regulation allows the Member States to use a national version derived from NACE Rev. 1.1 for national purposes. Such national versions must, however, fit into the structural and hierarchical framework laid down by NACE Rev. 1.1.</p>
LINKED CLASSIFICATIONS	<ol style="list-style-type: none"> <li>1) International Standard Industrial Classification of All Economic Activities, Third Revision (ISIC Rev.3.1) - agreement in principle at two-digit (Division) level;</li> <li>2) Statistical Classification of Products by Activity in the European Economic Community (CPA) - agreement in principle at four-digit (Class) level;</li> <li>3) National versions of NACE Rev.1.1 (Statistical Classification of Economic Activities in the European Community);</li> <li>4) General Industrial Classification of Economic Activities within the European Communities (NACE 70);</li> <li>5) Central Product Classification (CPC);</li> <li>6) Harmonized System (HS);</li> <li>7) Combined Nomenclature (CN);</li> <li>8) PRODCOM List.</li> </ol>

USAGE	Activities
MAIN STATISTICAL APPLICATION	1. Business Registers; 2. National and Regional Accounts; 3. Structural Business Statistics; 4. Industrial short-Term Indicators; 5. Labour force Survey; 6. other labour statistics.
MEDIA THROUGH WHICH AVAILABLE	RAMON: Eurostat's classifications server.
LANGUAGES	The 11 official languages of the European Communities: Danish; Dutch; English; Finnish; French; German; Greek; Italian; Portuguese; Spanish; Swedish.
ADDRESS OF RESPONSIBLE AGENT	Statistical Office of the European Communities Mr Niels Langkjær-Øhlenschläger (Unit D1) Bâtiment BECH B2/394 L - 2920 LUXEMBOURG Tel.: +352 4301 33410 Fax: +352 4301 33899 E-mail: niels.langkjaer@cec.eu.int

#### 4.4 North American Industry Classification System

FULL TITLE	<b>North American Industry Classification System, version used in the United States of America</b>
ABBREVIATION	<b>NAICS USA</b>
WWW ADDRESS	<a href="http://www.census.gov/epcd/www/naics.html">http://www.census.gov/epcd/www/naics.html</a> 2002 NAICS to 1987 SIC Bridge Between 1997 NAICS and SIC Non-US NAICS
ORIGINATING AUTHORITY	Office and Management and Budget, Executive Office of the President
CURRENT STATUS	Operational
IMPLEMENTATION DATE	1997 in Canada and the United States; 1998 in Mexico.
PREDECESSOR CLASSIFICATION	National industry classification systems (Standard Industrial Classification (1980) of Canada, Mexican Classification of Activities and Products (1994) and Standard Industrial Classification (1987) of the United States).
STRUCTURE	Level 1: 20 categories identified with two-digit codes; Level 2: 96 categories identified with three-digit codes; Level 3: 311 categories identified with four-digit codes; Level 4: 721 categories identified with five-digit codes; Level 5: 1170 categories identified with six-digit codes.
SUCCINCT DESCRIPTION	The new NAICS system provides common industry definitions for Canada, Mexico, and the United States to facilitate economic analyses that cover the economies of the three North American countries.

The development of NAICS was based on the following principles: (1) NAICS has been erected on a production-oriented, or supply-based, conceptual framework. This means that producing units that use identical or similar production processes are grouped together; (2) The system gives special attention to developing production-oriented classifications for (a) new and emerging industries, (b) service industries in general, and (c) industries engaged in the production of advanced technologies; 3) Time series continuity is maintained to the extent possible; 4) The system strives for compatibility with the 2-digit level of the International Standard Industrial Classification of All Economic Activities (ISIC, Rev.3) of the United Nations.

The USA, Canada and Mexico have developed national versions of NAICS.

LINKED CLASSIFICATIONS	International Standard Industrial Classification of All Economic Activities, Third Revision (ISIC Rev.3) (at two-digit level).
USAGE	Activities
MAIN STATISTICAL APPLICATION	Economic statistics
MEDIA THROUGH WHICH AVAILABLE	Hardcopy and electronic copy: from the under mentioned responsible agency;
LANGUAGES	English
ADDRESS OF RESPONSIBLE AGENT	Carole A. Ambler Coordinator Economic Classification Policy Committee Bureau of the Census U.S. Department of Commerce Room 2633-3 Washington DC 20233 Tel.: (301) 457-2668 Fax: (301) 457-1343

#### 4.5 Available correspondence tables at EUROSTAT

CPC 1.0 - SITC Rev.3	Correspondence table between the Central Product Classification, Version 1.0 and the Standard International Trade Classification, Third Revision
ISIC Rev.2 - ISIC Rev.3	Correspondence table between the International Standard Industrial Classification of All Economic Activities, Second Revision, and the International Standard Industrial Classification of All Economic Activities, Third Revision
ISIC Rev.3 - ISIC Rev.2	Correspondence table between the International Standard Industrial Classification of All Economic Activities, Third Revision, and the International Standard Industrial Classification of All Economic Activities, Second Revision
ISIC Rev.3 - NACE Rev.1	Correspondence table between the International Standard Industrial Classification of All Economic Activities, Third Revision, and the Statistical Classification of Economic Activities in the European

	Community, First Revision
ISIC Rev.3 - SITC Rev.3	Correspondence table between the International Standard Industrial Classification of All Economic Activities, Third Revision and the Standard International Trade Classification, Third Revision
NACE 1970 - NACE Rev.1	Correspondence table between the General Industrial Classification of Economic Activities within the European Communities (NACE 1970) and the Statistical Classification of Economic Activities in the European Community (NACE Rev.1)
NACE Rev.1 - ISIC Rev.3	Correspondence table between the Statistical Classification of Economic Activities in the European Community and the International Standard Industrial Classification of All Economic Activities, Third Revision
SITC Rev.3 - ISIC Rev.3	Correspondence table between the Standard International Trade Classification, Third Revision, and the International Standard Industrial Classification of All Economic Activities, Third Revision

## 5. Identification of organisations

### 5.1 D&B DUNS Number

FULL TITLE	<b>D&amp;B DUNS Number</b>
ABBREVIATION	<b>DUNS</b>
WWW ADDRESS	<a href="http://www.dnbmdd.com">http://www.dnbmdd.com</a>
CURRENT STATUS	Operational
STRUCTURE	distinctive nine-digit identification sequence
SUCCINCT DESCRIPTION	<p>The D&amp;B D-U-N-S Number is D&amp;B's distinctive nine-digit identification sequence, which links you to a wealth of quality information products and services originating exclusively from D&amp;B. The D&amp;B D-U-N-S Number is an internationally recognized common company identifier in EDI and global electronic commerce transactions.</p> <p>The world's most influential standards-setting organizations, more than 50 global, industry and trade associations, and the US Federal Government recognize, recommend and/or require the D&amp;B D-U-N-S Number.</p> <p>D&amp;B D-U-N-S Numbers are the key to building corporate family relationships in the D&amp;B file. Since each location of a business may have its own unique D&amp;B D-U-N-S Number, a large organization is likely to have many different D&amp;B D-U-N-S Numbers within its corporate "family tree". D&amp;B links the D&amp;B D-U-N-S Numbers of parents, subsidiaries, headquarters and branches on more than 6.0 million corporate family members around the world.</p>
USAGE	Activities
MEDIA THROUGH WHICH AVAILAB	WWW

LANGUAGES English  
ADDRESS OF RESPONSIBLE AGENT The D&B Corporation  
103 JFK Parkway, Short Hills, NJ 07078 U.S.A.

## 5.2 Federal Bulletin of Central Trade Register (Bundesanzeiger Zentralhandelsregister)

FULL TITLE **Bundesanzeiger Zentralhandelsregister**

ABBREVIATION **HRA, HRB**  
<http://www.bundesanzeiger.de>

WWW ADDRESS [http://www.gbi.de/\\_de/r\\_profisuche/banz\\_online.ein](http://www.gbi.de/_de/r_profisuche/banz_online.ein)  
[http://www.bnotk.de/BNotK-Service/Elektronische\\_Register/elektronisches\\_handelsregister.htm](http://www.bnotk.de/BNotK-Service/Elektronische_Register/elektronisches_handelsregister.htm)

CURRENT STATUS Operational

STRUCTURE The Numbers are autonomous assigned by each commercial court and are therefore not unique.  
  
This database contains information about 4.4 mills. Companies with about 6.6 mills. statements taken from the Zentralhandelsregister-supplement of the Bundesanzeiger since 1986. It consists of all the 8 statement-categories (Handelsregister, Partnerschaftsregister, Genossenschaftsregister, Musterrolle, Urheberrolle, Konkurse, Gesamtvollstreckungs- and Vergleichsverfahren, Güterrechtsfragen and miscellaneous).

SUCCINCT DESCRIPTION An electronic register-information-system (AUREG) is planned for Jan. 2004. It'll offer information about organisations in Berlin/Brandenburg in XML/SOAP and HTTP/S format.  
<http://www.bgs-ag.de/de/projekte/aureg/start.html>  
  
[http://www.bnotk.de/BNotK-Service/Elektronische\\_Register/elektronisches\\_handelsregister.htm](http://www.bnotk.de/BNotK-Service/Elektronische_Register/elektronisches_handelsregister.htm)

USAGE Activities

MEDIA THROUGH WHICH AVAILAB WWW

LANGUAGES German  
  
Bundesanzeiger Verlagsges. mbH

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## 6. Other identifications

### 6.1 Competence – management - system

The salient concept at the German employment office (*Arbeitsamt*)'s portal is the "competence – management – system" which ensures a standardisation of the industrial sectors, occupations and positions. The skills and qualification profiles oriented on job market facilitate the matching process of supply and demand. A common language and standard make for a consolidation and effective integration of job vacancies and applicant profiles from different sources.

### 6.2 Customer / Reference number

For the purpose of identification every registered user is given a customer number from a portal (i.e. [arbeitsagentur.de](http://arbeitsagentur.de)). This I.D. number is displayed on the user profile.

Every employment and position opening offer is assigned a reference number during the registration. While each employer can have only one I.D. number it may have more than one reference number depending on the number of job openings it has on offer.

## 7. Data-Exchange-Frameworks

### 7.1 HR-XML

The HR-XML Consortium has produced a library of more than 75 interdependent "XML schemas." XML Schemas define the data elements for particular HR transactions, as well as options and constraints governing the use of those elements. The HR-XML Consortium has produced schemas covering major processes, as well as component schemas, used across multiple business processes.

TITLE	<b>Competencies 1.1</b>
WWW ADDRESS	<a href="http://www.hr-xml.org">http://www.hr-xml.org</a>
AMENDMENT DATE	09-26-2003
DESCRIPTION	<p>The competency schema is simple and sufficiently flexible and generalized so that it is useful within a variety of business contexts. The schema provides structure to enable competencies to be easily compared, ranked, and evaluated. The schema is capable of referencing competency taxonomies from which competency descriptions were taken or used.</p> <p>The competencies schema would likely be used as an alternative or replacement for the "Skill" element within the HR-XML Consortium's Staffing Exchange Protocol. Thus, the Competency element is as compact and as simple as possible, while still meeting the other design goals listed above.</p>
SPECIFICATION	<a href="http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/Competencies.pdf">http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/Competencies.pdf</a>

TITLE	<b>Contact Method 1.0</b>
WWW ADDRESS	<a href="http://www.hr-xml.org">http://www.hr-xml.org</a>
AMENDMENT DATE	09-26-2003
DESCRIPTION	<p>The base component data types are <i>TelcomNumberType</i>, <i>MobileTelcomNumberType</i>, <i>InternetEmailAddressType</i>, and <i>InternetWebAddressType</i>, plus existing HR-XML data types of <i>PostalAddress</i>, and <i>PersonName</i>.</p> <p>Items within the Design Scope:</p> <ul style="list-style-type: none"> <li>• All components required for international and national representation of the telephone number.</li> <li>• A construct to represent telecommunication exchanges that clearly shows the contact device type – cell phone, facsimile, pager, etc.</li> </ul> <p>Items Outside of Design Scope:</p> <ul style="list-style-type: none"> <li>• Preference indicators – e.g. I prefer that you send e-mail rather than call.</li> </ul>
SPECIFICATION	<a href="http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/ContactMethod.pdf">http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/ContactMethod.pdf</a>
TITLE	<b>Date Time Data Types 1.1.1</b>
WWW ADDRESS	<a href="http://www.hr-xml.org">http://www.hr-xml.org</a>
AMENDMENT DATE	09-26-2003
DESCRIPTION	<p>Items Within the Design Scope:</p> <ul style="list-style-type: none"> <li>• Representing a point in time</li> <li>• Representing a time period (An interval of time with a start and an end)</li> <li>• Representing an unknown date, time or date/time value</li> <li>• Representing an open ended date/time value</li> <li>• Provide standard data types for: <ol style="list-style-type: none"> <li>1. Local Date, Local Time, Local DateTime</li> <li>2. Global Date, Global Time, Global DateTime</li> </ol> </li> </ul> <p>Items Outside of Design Scope:</p> <ul style="list-style-type: none"> <li>• Time scheduling rules, such as '7 days before Christmas' are not addressed in this document.</li> <li>• Likewise scheduling items of the form 'Every Tuesday at 10:00AM'</li> <li>• Representing a partial date, such as 2001-06 or a partial time, such as 12:00.</li> </ul>
SPECIFICATION	<a href="http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/DateTimeDataTypes.pdf">http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/DateTimeDataTypes.pdf</a>

TITLE **Education History 2.1**  
WWW ADDRESS <http://www.hr-xml.org>  
AMENDMENT DATE 09-26-2003  
DESCRIPTION This specification provides a method to exchange historical education.  
SPECIFICATION [http://ns.hr-xml.org/2\\_2/HR-XML-2\\_2/CPO/EducationHistory.pdf](http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/EducationHistory.pdf)

TITLE **Employment History 2.2**  
WWW ADDRESS <http://www.hr-xml.org>  
AMENDMENT DATE 09-01-2003  
DESCRIPTION This specification provides a method to exchange historical employment information. This information includes details about the occupation itself (time, type, position) as well as details about the employer (size, location, business area).  
SPECIFICATION [http://ns.hr-xml.org/2\\_2/HR-XML-2\\_2/CPO/EmploymentHistory.pdf](http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/EmploymentHistory.pdf)

TITLE **Organization 1.0**  
WWW ADDRESS <http://www.hr-xml.org>  
AMENDMENT DATE 09-26-2003

	Major Components
	<ul style="list-style-type: none"> <li>• Legal organizational units including for profit companies, non-profit companies, and governmental entities</li> <li>• Organizational units that are internal to legal units, including departments, project teams and cost centres.</li> </ul>
	Items Within the Design Scope
DESCRIPTION	<ul style="list-style-type: none"> <li>• Organizational business, legal, and tax related identifiers used in HR transactions</li> <li>• Relationships between organizations and their parts</li> <li>• Documentation of the legal structure of an organization</li> <li>• People and their roles within and organizational unit</li> </ul>
	Items Outside the Design Scope
	<ul style="list-style-type: none"> <li>• Schema needed to describe the query, add, modify, and delete actions needed for a complete organization description (i.e. org chart) facility</li> <li>• Enumeration of all possible organizational structure types in all countries</li> <li>• Military organizational structures</li> </ul>
SPECIFICATION	<a href="http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/Organization.pdf">http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/Organization.pdf</a>
TITLE	<b>WorkSite 2.0</b>
WWW ADDRESS	<a href="http://www.hr-xml.org">http://www.hr-xml.org</a>
AMENDMENT DATE	02-26-2003
	<ul style="list-style-type: none"> <li>• Information pertaining to the site or location of a job or position.</li> <li>• Information pertaining to the environment of a job or position.</li> </ul>
DESCRIPTION	<ul style="list-style-type: none"> <li>• General Considerations</li> <li>• Physical Considerations</li> <li>• Safety Equipment</li> <li>• Dress Code</li> </ul>
SPECIFICATION	<a href="http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/WorkSite.pdf">http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/WorkSite.pdf</a>
TITLE	<b>Resume 2.1</b>
WWW ADDRESS	<a href="http://www.hr-xml.org">http://www.hr-xml.org</a>
AMENDMENT DATE	09-01-2003

DESCRIPTION	<p>Resume modules include:</p> <ul style="list-style-type: none"> <li>• Distribution Guidelines</li> <li>• Employment History</li> <li>• Educational History</li> <li>• Licenses and Certifications</li> <li>• Military History</li> <li>• Patent History</li> <li>• Publication History</li> <li>• Speaking Events History</li> <li>• Qualifications (Competencies 1.1)</li> <li>• Languages</li> <li>• Achievements</li> <li>• References</li> <li>• Security Credentials</li> <li>• Resume Additional Items</li> </ul> <p>Items Outside of Design Scope</p> <ul style="list-style-type: none"> <li>• Resume Attachments</li> <li>• Job Preferences</li> <li>• Demographic Information</li> <li>• Remuneration/Compensation</li> </ul>
SPECIFICATION	<a href="http://ns.hr-xml.org/2_2/HR-XML-2_2/SEP/Resume.pdf">http://ns.hr-xml.org/2_2/HR-XML-2_2/SEP/Resume.pdf</a>
TITLE	<b>Identifier Types 1.0</b>
WWW ADDRESS	<a href="http://www.hr-xml.org">http://www.hr-xml.org</a>
AMENDMENT DATE	02-26-2003
DESCRIPTION	<p>Although additional identifiers may be developed, this document defines the following schemas:</p> <ul style="list-style-type: none"> <li>• Internet domain name identifies Internet domains used within a particular organization.</li> <li>• Entity reference may be used to specify the name and id of an entity.</li> <li>• Duns number is used to define the pattern when the Dun &amp; Bradstreet identifier is required. D&amp;B D-U-N-S Number is a registered trademark.</li> <li>• Entity id may be used to specify the id of an entity. It is fully described in a separate document.</li> </ul>
SPECIFICATION	<a href="http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/IdentifierTypes.pdf">http://ns.hr-xml.org/2_2/HR-XML-2_2/CPO/IdentifierTypes.pdf</a>
TITLE	<b>Staffing Exchange Protocol TM 2.0</b>

WWW ADDRESS	<a href="http://www.hr-xml.org">http://www.hr-xml.org</a>
AMENDMENT DATE	11-21-2003
DESCRIPTION	<p>The Staffing Exchange Protocol (SEP) is a set of XML specifications that support many types of recruiting and staffing related transactions. Transactions supported by Staffing Exchange</p> <p>Protocol include the posting of job or position opportunities to job boards and the exchange of a candidate resume and/or profile data independent of or related to those postings to other recruiting and sourcing venues.</p> <p>SEP 2.0 was designed with multi-national input from a variety of stakeholder groups including hiring organizations, staffing companies, job boards/career portal sites, applicant tracking systems and service providers, assessment providers and HRIS vendors.</p> <p>Staffing Exchange Protocol consists of the following document types and outlines the transactions they facilitate:</p> <ul style="list-style-type: none"> <li>• Resume</li> <li>• Candidate</li> <li>• Position Opening</li> </ul>
SPECIFICATION	<a href="http://ns.hr-xml.org/2_2/HR-XML-2_2/SEP/StaffingExchangeProtocol.pdf">http://ns.hr-xml.org/2_2/HR-XML-2_2/SEP/StaffingExchangeProtocol.pdf</a>
TITLE	<b>Staffing Industry Data Exchange Standards 1.0</b>
WWW ADDRESS	<a href="http://www.hr-xml.org">http://www.hr-xml.org</a>
AMENDMENT DATE	02-26-2003

Items Within Scope Business processes supported in SIDES 1.0 include the ability to exchange:

- Order information between a staffing supplier and a staffing customer or their intermediary (StaffingOrder).
- Information describing a human resource between a staffing supplier and a staffing customer or their intermediary (HumanResource).
- Other basic request/response communication between a staffing supplier and a staffing customer or their intermediary (StaffingAction).
- Assignment information between a staffing supplier and a staffing customer or their intermediary. (Assignment).
- Timecard and expense information between a staffing supplier and a staffing customer or their intermediary. (Extended TimeCard)
- An Invoice between a staffing supplier and a staffing customer or their intermediary (Invoice).

Items Outside of Scope

DESCRIPTION

- Implementation guidelines for message delivery. See Implementation Considerations section within this document.
- Skills taxonomy.
- Selection and matching methodologies. (Performed by the staffing supplier(s) prior to the submission of a HumanResource XML document to a staffing customer or intermediary).
- Security - This responsibility resides with system integrators during implementation of data exchange systems.
- Post-assignment evaluation process. This may be a future SIDES consideration.
- Reporting. This may be a future SIDES consideration.
- Accounting and payment processes. This may be a future SIDES consideration.
- Background checks, drug screening, reference checks, etc. This is being developed by a separate HR-XML workgroup. SIDES provides for linkage.
- Payroll processing.
- Sub-contractor or Affiliate Vendor contracts. This may be a future SIDES consideration.

SPECIFICATION

[http://ns.hr-xml.org/2\\_2/HR-XML-2\\_2/SIDES/SIDES.pdf](http://ns.hr-xml.org/2_2/HR-XML-2_2/SIDES/SIDES.pdf)

## 7.2 HR-BA-XML

The HR-BA-XML standard is used for exchanging information about applicants and job-offers between the federal institution and external partners (employers, companies, job placement agents, etc.). It was developed by Bundesanstalt für Arbeit and is an extension of the international HR-XML standard. The categories defined in HR-XML were supplemented on the basis of employer requirements. This improves comparability and the quality of the employer-employee matching [8].

**Additions to HR-XML „Staffing Exchange Protocol Version 1.2“ (SEP):**

- Statements about availability of the applicant
- Extended information about payments
- Statements about demanded applicant mobility
- Statements of the willingness to travel
- Statements about the type of offer / application (Job, apprenticeship place, internship)
- Statements about the field of application
- Information about occupation time limitations

### **7.3 HR-XML-SE**

The Swedish schema work is based, like the HR-BA-XML, on the “Staffing Exchange Protocol” developed by the HR-XML Consortium. The Swedish protocol consists of the original HR-XML parts (transformed from DTD's into schemas), to which schemas with Swedish extensions are added.

**The schema group contains eight different schemas:**

- Job Position Seeker (JPS) Swedish Extension
- Job Position Posting (JPP) Swedish Extension
- Postal Address-SE
- Person Name-SE
- Common Definitions-SE
- COM Swedish Extension

## **V Conclusion**

In this document we described the current and target states of the online recruitment processes. We also talked about the common standards and classifications of occupation, competence and economic activities.

We researched how recruitment processes could be supported by the new technology - Semantic Web. For this it confronts a usual recruitment process it is found today in many organizations with a potential future process, describing changes in the technologies used, changes in the business models of the participants and potential overall economic advantages. We also suggested improvements for several steps of the recruitment process of organizations by enhancing job postings and job applications with semantic annotations.

## VI References

- [1] <http://www.monster.de>
- [2] <http://www.arbeitsamt.de>
- [3] <http://www.arbeitsagentur.de>
- [4] <http://www.jobpilot.de> (net)
- [5] <http://www.ams.se>
- [6] <http://europa.eu.int/eures/>
- [7] <http://www.stepstone.de>
- [8] [http://www.arbeitsamt.de/hst/markt/faq\\_virtueller\\_arbeitsmarkt.pdf](http://www.arbeitsamt.de/hst/markt/faq_virtueller_arbeitsmarkt.pdf)
- [9] [http://www.arbeitsamt.de/hst/markt/virtueller\\_arbeitsmarkt\\_white\\_Paper\\_hr\\_ba\\_xml.pdf](http://www.arbeitsamt.de/hst/markt/virtueller_arbeitsmarkt_white_Paper_hr_ba_xml.pdf)
- [10] <http://www.hr-xml.org>
- [11] <http://www.acm.org/sigmod/dbjobs/posting-guide.html>
- [12] <http://www.ilo.org/public/english/bureau/stat/download/res/isco.pdf>
- [13] <http://www.ica-it.org/conf36/docs/Ahmaned.pdf>
- [14] [http://www.arbeitsamt.de/hst/markt/virtueller\\_arbeitsmarkt\\_kooperationen.pdf](http://www.arbeitsamt.de/hst/markt/virtueller_arbeitsmarkt_kooperationen.pdf)
- [15] <http://www.kowien.uni-essen.de/>

## Was ist das XML Clearinghouse?

Das XML Clearinghouse für Berlin und Brandenburg ermöglicht Wissenstransfer zu XML-Technologien durch öffentlich zugängliche Dienstleistungen. Es beobachtet, bereitet auf und vermittelt die Entwicklung von XML-Technologien und deren Anwendungen. Als Teilprojekt des regionalen Wachstumskerns <xmlcity:berlin> sorgt es für einen Wissenstransfer von der Forschung zur Anwendung in der Region Berlin und Brandenburg.

## Ein Forum zum Wissenstransfer

Das XML Clearinghouse bietet Foren für Akteure aus Forschung, Wirtschaft und Intermediären zu gemeinsamen Aktivitäten. Ein Webportal ist Anlaufpunkt für XML-Informationen und regionalen Angeboten dazu. Fokussierte wissenschaftliche Workshops beleuchten aktuelle Themen, einzelne Entwicklungen werden in Schulungen didaktisch aufbereitet dargestellt. Die Vorträge im regelmäßigen XML-Kolloquium berichten von neuen Entwicklungen und Anwendungen.

## Workshops

In wissenschaftlichen Workshops werden in begutachteten Beiträgen neue Arbeiten mit XML-Bezug dargestellt. Diese Veranstaltungen finden mit Unterstützung unterschiedlicher Informatikgesellschaften, wie zum Beispiel der Fachgruppe Multimedia der Gesellschaft für Informatik, statt und haben dadurch einen hohen Stellenwert.

## Schulungen

Eine Schulungsreihe dient dem Wissenstransfer zu XML-Technologien. Das XML Clearinghouse vermittelt ausgewählte XML-Themen in Tiefe und entwickelt dafür Schulungsmaterial.

## Kolloquium

Das XML Clearinghouse bietet eine frei zugängliche Kolloquiumsreihe an, die abwechselnd an der FU Berlin und HU zu Berlin durchgeführt wird. Im Rahmen dieses Kolloquiums finden Vorträge und Diskussionen statt.

## Web-Portal

Ergänzend zu den Veranstaltungen bietet das XML Clearinghouse eine öffentlich zugängliche Informationssammlung an. Gegenstand der Sammlung ist XML-Technologie und deren Standardisierung und Anwendung. Das Webportal enthält insbesondere Informationen zu XML mit Bezug zu Berlin und Brandenburg an.