CEN

WORKSHOP

AGREEMENT

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English version

Classification and catalogue systems used in electronic public and private procurement

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This CEN Workshop Agreement (CWA) contains an analysis of the main classification systems and catalogues used in Europe for electronic procurement in the private and public sectors. The production of the CWA was formally accepted at the Workshop eCAT 11th plenary meeting held on 3 April 2009, when the CC3P project was launched.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

The CWA contains:

- a study on similarities and differences between the four main existing product classifications in Europe and proposed harmonization and mapping methodologies;

- a list of identified missing domains in the CPV (Common Procurement Vocabulary), eCl@ss and GS1/GPC in relation with existing sectors in UNSPC and its application to some chosen sectors (subject to experts time);

- recommendations on the use of classification and mapping in electronic catalogues;

- description on how to use the mapping tools that will be developed by software providers so as to increase the interoperability between all four classifications;

- recommendations on a coherent product chain and its associated business processes (properties, product description, dictionaries, classifications and catalogues) for the private and public sectors;

- Identification of areas of improvement in the CPV.

The CWA was endorsed as CEN Workshop Agreement at the meeting held in Brussels on 19 April 2010 and following an electronic round of comments ended on 28 April 2010. The list of companies which supported the CWA is provided hereunder:

- AFIM, Association française des Ingénieurs et responsables de maintenance, France
- Raymond Betz, Consultant, Belgium
- eCl@ss e.V., Germany
- FernUniversity of Hagen, Germany
- IFCC, Germany
- Infoterm (International Information Centre for Terminology), Austria
- Pragmeta Knowledge Clout, Belgium
- Paradine, Austria
- Zoltan Patkai, Consultant, Belgium
- PEPPOL project
- Semaino Technologies, Germany
- Steinbeis Beratungszentrum EB, Germany
- TANGER computersystems, Czech Republic
- TermNet (International Network for Terminology), Austria
- UNSPSC, USA
- Stichting USPI-NL
- Aurélie Virgili, Consultant, Belgium

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Comments or suggestions from the users of the CEN Workshop Agreement are welcome and should be addressed to the CEN-CENELEC Management Centre.

1 Scope

The present document studies four product classifications used in eBusiness in Europe. Section 5 indicates the differences between the four classifications at all levels. Section 6 provides recommendations on interoperability of product classifications.

The versions of the standards used in the work are the following:

- UNSPSC v11 English
- eCl@ss 6.0.1 English
- GPC 30062008 English
- CPV 2008 English

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

DIN 4002-100, *Properties and their scopes for product data exchange – Part 100: Properties on www.DINsml.net*

IEC 61360 *Standard data element types with associated classification scheme for electric components*

ISO 13584 *Industrial automation systems and integration – Parts library*

3 Definitions

- (adopted from Bowker / Star (1999): *Sorting things out: Classification and Its Consequences*):

  A *classification* is a spatial, temporal, or spatio-temporal segmentation of the world. A *classification system* is a set of boxes (metaphorical or literal) into which things can be put to then do some kind of work—bureaucratic or knowledge production. In an abstract, ideal sense, a classification system exhibits the following properties:
  - There are consistent, unique classificatory principles in operation.
  - The categories are mutually exclusive.
  - The system is complete.

- The task of *product classification is to* assign each product or service to a product/service group (…) corresponding to common attributes or application areas.' The classification systems may cover services. Source CWA 15045:2004.

- Classification classes or classes
- Level of classes (1st to 4th), the 4th level being the most specific and representing the product class
- The 1st level is the most general hierarchical level of classification classes and named "domain" or "segment"
- The characteristics describe classification classes and are attached to them (eCl@ss, GPC, CPV)
- The following definitions for the term "domain" were found and considered to be possibly fitting the use of this term in the terms of reference:
  - a well-defined set (ISO/TS 19103:2005)
  - a field of special knowledge (ISO 17115:2007)
  - an area of knowledge or activity characterized by a set of concepts and terminology understood by practitioners in that area (ISO/IEC 19501:2005)
  - the highest or most significant hierarchical level in the three-level addressing hierarchy (ISO/IEC 14165-141:2001)

  Source: ISO Concept Database, 2009 (http://cdb.iso.org)

4 Description of the classification systems

4.1 CPV

4.1.1 General

CPV is the Common Procurement Vocabulary. It is a classification system used in public procurement in the European Union. It applies to products, services and works.

4.1.2 History

The first version of the CPV was born in 1993. The latest version is CPV 2008.

4.1.3 Intended purpose

CPV is mandatory when the contracting authorities and entities, in the sense of directives 2004/18/EC and 2004/17/EC of the European Parliament and of the Council of 31 March 2004, publish public procurement notices in the Official Journal of the European Union.

CPV is the only classification system that has to be used for the publication of public procurement notices in the EU. Other classification systems can be used in the descriptive parts of public procurement notices or in the tender documentation.

From a practical point of view, CPV is used

- As a reference in any public procurement notice (prior information notices, calls for tender, contract award notices, etc)
- To search business opportunities in TED
- To find contract notices in the archive of TED

TED or "Tenders Electronic Daily" is the website where notices for public contracts in Europe are published. It is the online version of the 'Supplement to the Official Journal of the European Union' where all tenders above a specific limit must be published.

It is important to note that CPV is included in a larger effort to simplify and modernise public procurement.

The targeted users are: contracting authorities, suppliers and their intermediaries.

4.1.4 Structure

The CPV comprises two pieces called the main vocabulary and the supplementary vocabulary.
The main vocabulary is the highest level. The supplementary vocabulary is used to give additional information on the products.

There are 9 454 codes in the main vocabulary and 903 codes in the supplementary vocabulary.

4.1.5 Coding structure

4.1.5.1 The main vocabulary

The main vocabulary codes are up to 9-digits long, all numerical.

- The ninth digit is a check digit.
- The first two digits identify the division.
- The first three digits identify the group.
- The first four digits identify the class.
- The first five digits identify the category.

The following three digits provide more precision within a category.

At the time of publication, there is no definition for division, group, class and category. The hierarchy of the main vocabulary is purely semantic. It is intended to make the CPV as clear and meaningful as possible for the end-user.

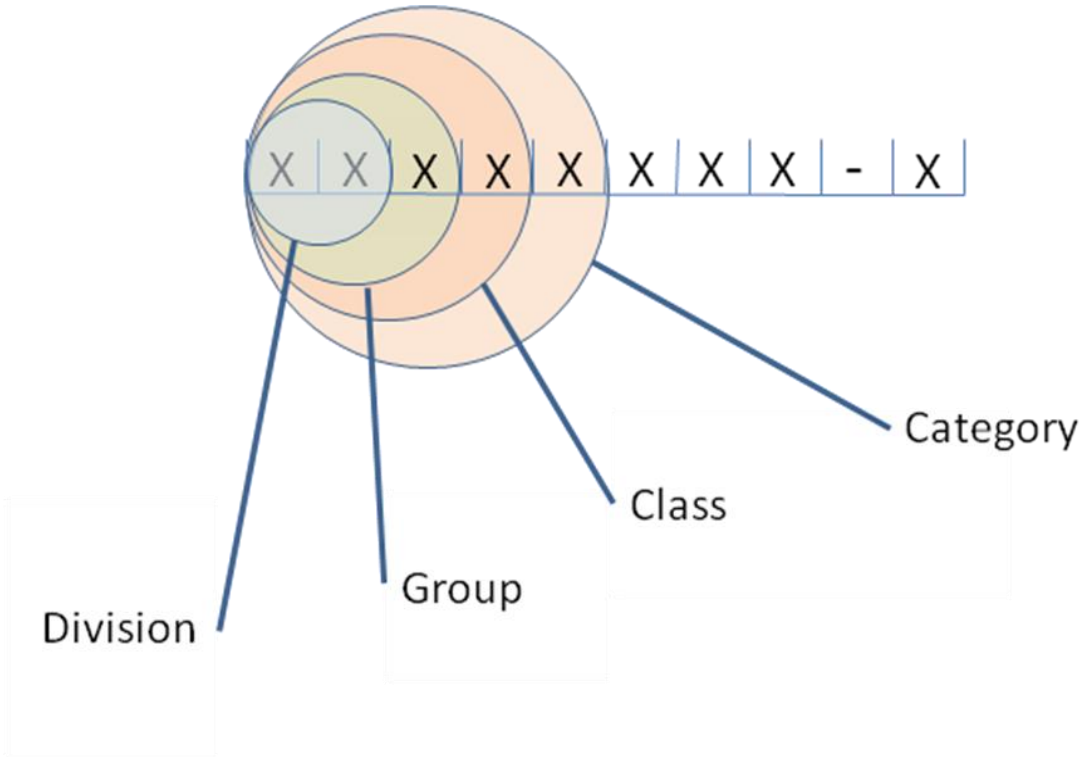

Figure 1 - Structure of main vocabulary codes

Example: 03000000-1 is agricultural, farming, fishing and related products division.

4.1.5.2 The supplementary vocabulary

The supplementary vocabulary can be used to supplement the main vocabulary in order to expand the description of the products.

The supplementary codes are five-digit long and comprise:

- A first digit (a letter) to identify the section
- A second digit (a letter) to identify the group
- The two following digits identify the attributes
- The last digit is a check digit

A code from the supplementary vocabulary can technically be used with any code from the main vocabulary.

4.1.6 Release policy

The provision of new versions depends on numerous factors such as political decisions or legislative activity. It can be generally expected that the CPV is modified not less than once in every three to four years, but other factors may influence this informal term.

4.1.7 Release roadmap

There is no release roadmap.

4.1.8 Version compatibility

There is no version compatibility policy applied today. From one version to the next version, codes can be added, transferred or removed. Descriptions that are attached to the codes can be amended. The structure can also be changed.

For CPV, a numerical code that has been deleted in one of the updates can be reused. Even if we try to avoid it for two successive versions, it has already been the case in the past. As there is only one version of CPV valid at a time, any reused code should be placed in context to understand its meaning. As CPV is meant to be used for public procurement notices and procedures, each use of a code is by default linked to a specific date and time, and thus to a specific version. When moving from a version to the following one, a transition procedure is set in place to avoid conflicting use of codes.

The Commission has access to statistics on the actual use of the codes and can determine which codes are not used. Therefore the Commission can remove those codes, but only if those codes are proven to be useless or if they end up being covered by more generic descriptions or with another wording.

The Commission provides mapping tables between versions.

4.1.9 Development process

The Commission welcomes any feedback from the users of CPV, e.g. to add a code or to correct a wording, in any official language of the European Union. Mailboxes to which users can send comments, requests etc. are available[1] on the web. They serve as entry points to provide feedback. When needed, interest groups are consulted to provide information on a specific division.

Each new version follows the normal Community legislative process. The draft is first circulated to all interested Commission DGs. It is next circulated to the State Members through the Advisory Committee for Public Contracts or ACPC. At the next step, the draft is reviewed by the Committee of the Regions and the Economic and Social Committee and then to the European Parliament. Since so many bodies are involved in the process there is no way to know if the codes are reviewed by external subject-matter experts.

There is currently no formal review by a classification expert committee or quality control by technical bodies such as CEN.

4.1.10 Conditions of use

CPV is free of use. Being a regulation directly applicable in all the Member States, it is available free of charge in the Official Journal of the European Union.

4.1.11 Access to the vocabularies

The main vocabulary and the supplementary vocabulary can be downloaded from the SIMAP website in four formats: PDF, XML, ODS and XLS. They can also be downloaded[2].

SIMAP is a portal that provides access to information about public procurement in Europe.

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[1] http://ec.europa.eu/internal_market/publicprocurement/contact_en.htm

[2] http://eur-lex.europa.eu

4.2 eCl@ss – classification and product description

4.2.1 General

eCl@ss is an international standard for classification and product description. It is a horizontal standard, i.e. cross-segmental, therefore it includes products from a lot of different industrial sectors or branches. eCl@ss is industry-driven, i.e. the industry itself developed eCl@ss to cover their diverse requirements. At the same time, eCl@ss relies on national and international standards, e.g. a data model and identification scheme based on ISO standards, properties to be standardized in the DIN property server etc[3]. By using existing international standards, eCl@ss enhances the security for the users.

4.2.2 History

In 1999 an eCl@ss work group was founded by major German companies (mainly from the chemistry sector) and German industrial associations. eCl@ss as an international association based in Germany (eCl@ss e.V.) was founded in November 2000 and took responsibility for standardizing product and service classification and description. A list of all association members is published on the eCl@ss website.

The association started with eCl@ss version 3.0 in English and German comprising the following content:

Segments	Classes (all levels)	Keywords	Properties
21	4.800	8.000	2.500

Figure 2 - eCl@ss 3.0: Number of structural elements

With eCl@ss 4.1 more languages besides English and German were published including French, Spanish, Italian and Czech. In eCl@ss 5.1.2 more languages were added (see figure 4). Today the latest version eCl@ss 6.0.1 – available in English and German – comprises the listed content including values:

Segments	Classes (all levels)	Keywords	Properties	Values
26	33.000	51.000	8.600	6.800

Figure 3 - eCl@ss 6.0.1: Number of structural elements

In the eCl@ss ServicePortal all languages included in Figure 4 are included for further development and translation.

[3] Data model based on ISO 13584 (PLIB), identification scheme based on ISO 29002. The DIN property server: www.dinsml.net

eCl@ss language versions	EN	DE	FR	ZH	ES	IT	ZH_TW	CZ	JA	KO	TR	PT	NL	RU	TH
5.0	X	X	X												
5.1	X	X	X	X	X	X									
5.1.1	X	X	X	X	X	X	CC/KW	CC/KW	CC/KW	CC/KW	CC	CC	CC	CC	CC
5.1.2	X	X													
5.1.3	X	X													
5.1.4	X	X													
6.0	X	X									CC				
6.1	X	X													
6.2	X	X													

Key
X = full version available (classification classes, keywords, properties, values)
CC = only classification classes translated
KW = keywords included

Figure 4 - Available eCl@ss language versions (updated: 2010-03-18)

The eCl@ss association is a non-profit organization, which defines, further develops and markets the cross-industry and international classification standard of the same name. It is supported by ordinary and supporting members from international companies, associations and institutions and cooperates with reputable strategic partners from the international standardization, norms and IT sectors and associations.

4.2.3 Structure

The eCl@ss standard for classification and product description is a hierarchical system for grouping materials, products and services according to a logical structure with a level detail that corresponds to the product-specific properties that can be described using norm-conforming properties. Products and services can be allocated to a four-stage, numeric eCl@ss class structure, i.e. they are being classified in a hierarchical structure. In addition to this hierarchy, eCl@ss provides the possibility to describe a product in a standardized way. Normative references include, among others, its data model which is based on the ISO 13584 and IEC 61360.

On the fourth level, products and services can be unambiguously described by properties (e.g. material, colour, article number) that are partly standardized by the German National Standardization Institute DIN[4]. The sum of all properties of a subgroup is called a set of properties. A property can have values which determine the most useful characteristics of the property (e.g. property: colour, value: red). The sum of all values of a property is called a set of values. A set of values is open, which means it does not have to be complete.

[4] www.dinsml.net

In its current export format[5] eCl@ss contains 4 different structural elements:

- classification classes
- keywords
- properties
- values

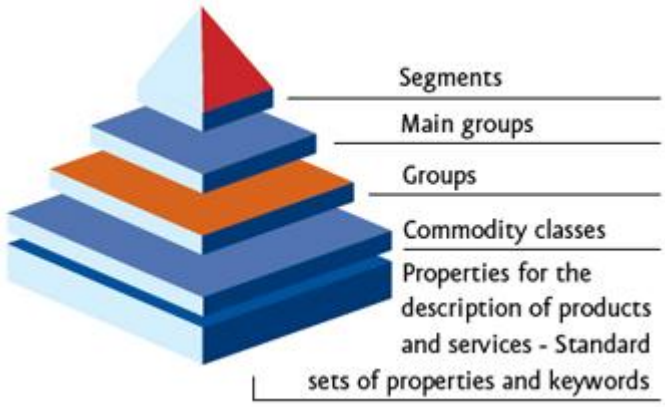

Figure 5 - The eCl@ss structure

The eCl@ss classification consists of four hierarchical levels of classification classes (see figure 5):

- segments (level 1, highest level)
- main groups (level 2)
- groups (level 3)
- sub groups or commodity classes (level 4)

The different classification hierarchies are defined as shown in table 1.

Table 1 - Definition of eCl@ss classification hierarchy

Hierarchical level	**1st**	**2nd**	**3rd**	**4th**
Name of level	**Segment**	**Main group**	**Group**	**Sub-group/commodity class**
Definition	Represents the procurement market of all included products, materials and services and asks the question: to which procurement market does the product/material/service belong?	Details the procurement market and asks the question: what area of expertise / specialization is the product, material or service assigned to? (E.g. the entire product range by a wholesale company of fasteners.)	Represents a more detailed view of the procurement market that asks the question: what products, materials or services are mentioned? (E.g. the complete product portfolio of a screw manufacturer.)	Represents the product, material or service itself which asks the question: which technical model of a product is concerned? (e.g. knurled screw)

[5] Since release 6.0 the eCl@ss database has included many more structural elements such as application classes, aspects, blocks, units of measure etc. according to ISO 13584 that will not be published before the next major release 7.0. However, the eCl@ss product in its current export format (release 6.0.1 being used in this document as the current version at the beginning of the project) does not yet show them. Therefore and as they do not play a crucial role for the comparison of the classification systems as they would do for product description, they will not further be considered in this document.

Hierarchical level	1st	2nd	3rd	4th
Name of level	Segment	Main group	Group	Sub-group/commodity class
Details	• represents products for procurement. - Negative example would be: Mining - Positive example would be medical technology • includes a large, overlap-free product segment that limits and differentiates. -Negative example would be Gadgets - Positive example would be Space Technology • includes a useful structure/breakdown on all lower levels.	• includes a sample defined by corresponding content structures of the segment. • includes a complete picture of branch-specific product concentrations.	• includes a sample defined by corresponding content structures of the main group. • includes a reasonable and complete breakdown of branch-specific product concentrations.	• includes a sample defined by associated content structures of the group. • is the smallest, selectable, overlap-free unit of similar products (classical understanding of the material or commodity group). • provides the description of unique products with the help of product-related characteristics. • represents all relevant business-related issues (fields, divisions, departments) with the help of product-related feature views.

On each level, keywords are attached to classes to help search for the same product with different possible names used by the market. With more than 51,000 keywords for about 33,000 classes there are 84,000 potential product names included in the eCl@ss standard.

The eCl@ss data model is designed in such a way that products and services are classified exclusively at the commodity class level (level 4). Commodity classes are described by standardized properties. By providing value lists for these properties one can choose certain specific characteristics for the classified product. Values are being attached to these properties.

Properties and values are multi-usable, i.e. a property can be assigned to 1-n classes, and a value can be assigned to 1-n properties. Currently more than 500,000 class-property-relations with more than 13,000 property-value-relations lead to an incomparably high number of potentially described products.

Each structural element of the eCl@ss standard is identified by a globally unique identifier, the IRDI (international registration data identifier)[6] including a global code for eCl@ss (0173), a code for the element type (e.g. 02 for property), an unambiguous, 6-digit element identifier (e.g. AAW872) and a 3-digit version number to identify updates of the same element (e.g. corrections). This way, electronic exchange is based on unique identifiers – independent of changing wordings or classification codes, which is recommended by the CEN ISSS WS eCAT-ePPS in its CWA and based on ISO 29002.

Furthermore, classification classes are described with an 8-digit coded name, the classification code that represents the classification hierarchy (e.g. 23-01-03-01 Handwheel). This classification code might vary in

6 eCl@ss is based on the ISO 29002 described in the CEN ISSS WS eCAT-ePPS final Draft CWA, p. 43ff: “Identification Scheme for dictionary elements: One of the backbones of ISO 29002 to achieve the first goals is the provision of an identification scheme which allows to identify dictionary elements uniquely worldwide.” The IRDI used here is based on ISO-IEC 11179.

different releases, if re-structuring of the classification hierarchy is necessary. The IRDI will never change for an element, so that upgrading to a new release can be done automatically with the help of unique identifiers.

Example 1:
A chromium-plated handwheel is described in eCl@ss as follows (more varieties possible with other values and properties):

Segment	23-00-00-00 Machine element, fixing, mounting
Main group	23-01-00-00 Control element
Group	23-01-03-00 Handwheel (control elem.)
Commodity Class	**23-01-03-01 Handwheel (ID: AAW872-004)**

Properties	Acceptance Diameter
	Condition if surface
	Diameter of inner tooth trace
	Diameter of outer tooth trace
	EAN code
	Form of axle holder
	Grip design
	Height of hub up to end of grip
	Height of the hub up to the hand wheel
	Key width
	Manufacturer name
	Manufacturer product number
	Material
	Material in accordance with norm
	Number of arms
	Product name
	Product type description
	Publication date (year-month)
	standard letter to the standard number
	Supplier product number
	Surface protection in accordance with norm
	Taper
	Width of rim
	Surface protection (ID: BAB101-002)
Values	*anodized*
	armored
	Chromium-plated (ID: CAA119-001)
	copper-plated
	Electroplating
	Enamelled
	lacquered
	nickel-plated
	phosphated
	Rubberized
	Other

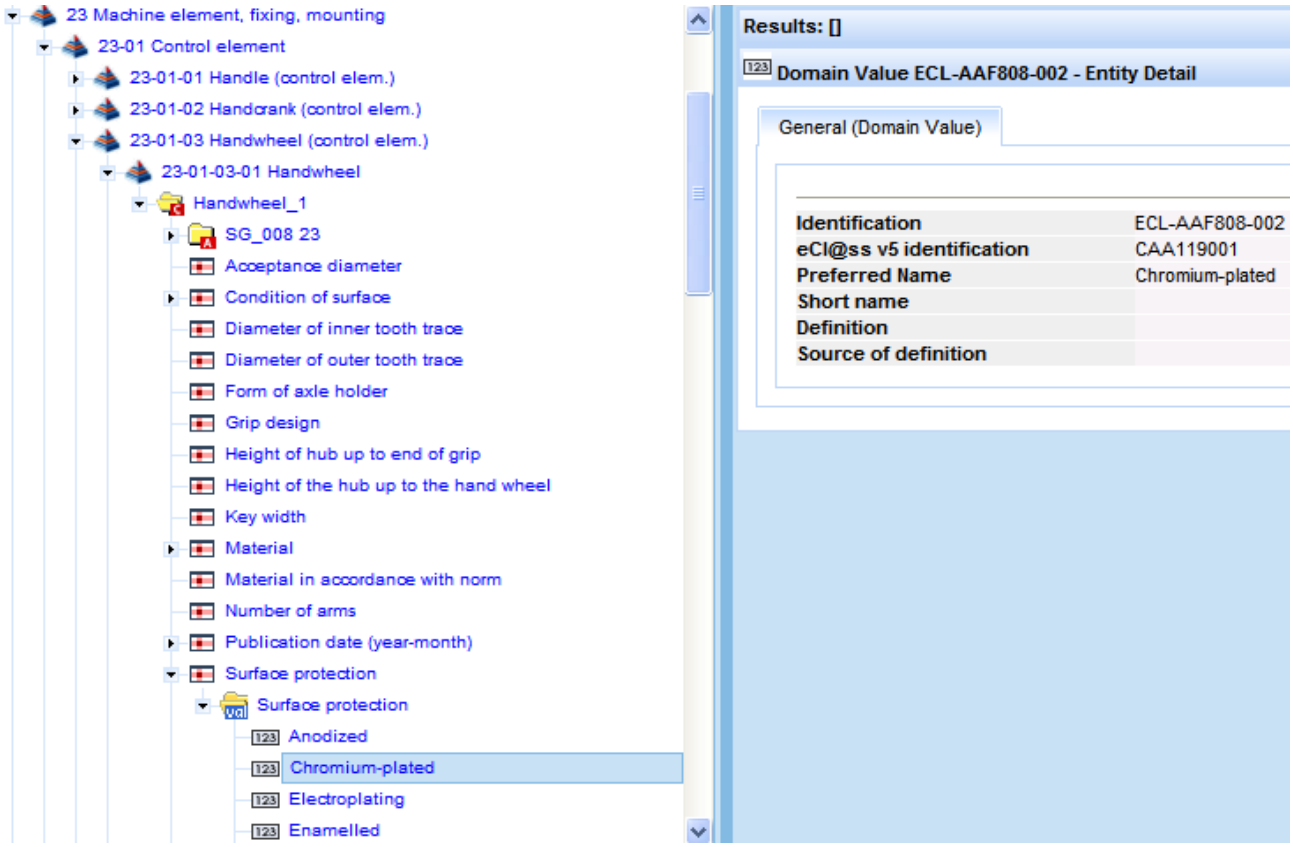

Figure 6 - The eCl@ss structure: Example 1 (View in the eCl@ss ServicePortal)

4.2.4 Release policy

Since version 6.0.1 eCl@ss differentiates between 3 different types of releases:

- MajorReleases (x.0)
  - include every kind of change including structural changes
  - are generally valid for approx. 3 to 4 years

- MinorReleases (n.x)
  - include additions (possible on all levels), the removal of erroneous keywords and, if necessary, correction of clerical errors
  - are designed to be upwards-compatible
  - are published once or twice a year

- ServicePacks (n.n.x)
  - exclusively comprise the removal of potential errors that do not affect the content, therefore generally the correction of clerical errors and translations
  - are designed for short-term use to correct major errors in a specific language version and are therefore language-specific
  - are not integrated into the release roadmap anymore and can therefore be published if needed for every single language version
  - *Before* release 6.0.1 ServicePacks included the additions as well (new classes at levels 2 – 4, new keywords, properties and values)

The release number comprises a "Major Release Number" (**x**.0) and a "Minor Release Number" (n.**x**). A ServicePack additionally comprises a "ServicePack Number" (n.n.**x**).

Example 2:
Current version 6.0.1 is a ServicePack with textual corrections in English and German of version 6.0, but no changes of the content. Next version will be MinorRelease 6.1 (Mid 2009) with new classes, keywords, properties and values. Next MajorRelease 7.0 end of 2010 will at least contain a re-structure of segments 25 (services), 27 (electric engineering) and 34 (medicine, medical technology).

4.2.5 Release roadmap

eCl@ss is a classification system that ensures its users a high level of planning security. Therefore an eCl@ss Major Release will remain stable for 3-4 years. Updates and enhancements will be made during this time but structural changes will not be made. Enhancements in MinorRelease will be released once or twice a year in order to implement customer requirements in an efficient and targeted manner. See figure7 for the planned timeline

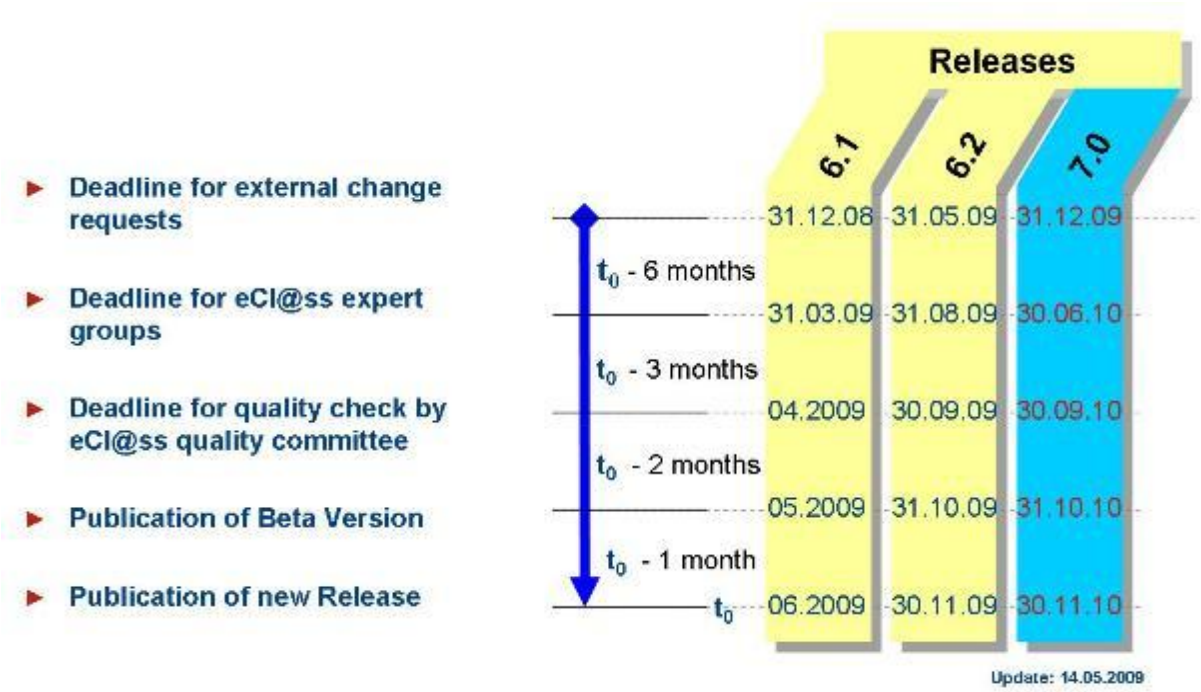

Figure 7 - eCl@ss Release Roadmap

eCl@ss offers security of investment to its users due to its standardized international data model, which is derived from DIN 4002[7], IEC 61360 and ISO 13584, and the use of standardized properties (also DIN).

As a cross-branch standard, eCl@ss initiates projects to harmonize and thereby optimize its content with branch-specific standards. The **bau:class**[8]-project enhanced segment 22 “Construction technology”, currently several of the most important branch-specific classification standards are integrated into eCl@ss: **PI**[9] (European white goods standard hosted by CECED), **ETIM**[10] (European electro industry standard), **proficl@ss**[11] (German tool standard) and **PROLIST**[12] (International standard for electric engineering and process industry). The objective here consists of harmonizing the individual industry solutions and achieving interoperability. eCl@ss will also start a project with the DIN in 2010 to standardize all of its properties.

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[7] www.dinsml.net
[8] www.bauclass.org
[9] www.ceced.eu
[10] www.etim.de
[11] www.proficlass.de
[12] www.prolist.org

4.2.6 Version compatibility

Mapping tables between two consecutive MajorReleases are available for all updates starting with eCl@ss version 4.0 to ordinary members for internal usage free of charge. Starting with the mapping tables eCl@ss 5.x to 6.x they are available to the public for the first time as a downloadable product in the eCl@ss DownloadPortal[13].

MinorReleases are compatible within the same MajorRelease, i.e. all 6.x-Versions are downward-compatible as only new or changed elements are included. For a 6.x-to-7.x-Mapping transaction update files will be available for all further releases.

4.2.7 Maintenance process

The eCl@ss maintenance process is based on the recommended process proposed by the CEN WS ePDC[14] (see also Figure 8 below), which itself is based on ISO requirements and at the same time similar to the maintenance process of other standards as e.g. the DIN property server[15.] To facilitate the development of the standard for every interested user, the eCl@ss ServicePortal was developed to give every user the possibility to requests changes of the standard in an online portal.

Submitting requests

Every user, member or not, has the option to make change and enhancement requests on the eCl@ss ServicePortal[16], i.e. eCl@ss is an industry-driven standard. It is primarily developed and maintained by its members and users. Applications made by members of the eCl@ss association members for integration of new classes and properties will be handled with priority as a benefit. The main language of eCl@ss is English (USA), so that every change request has to be mandatorily filled out in English.

The processing time for change requests depends on the type and scope of the change. If a structure already exists and only requires modification, then the request may be integrated as early as the next MinorRelease. Requests requiring vast changes to the existing structure can only be implemented every 3-4 years within the context of a MajorRelease.

Editing requests

Several committees and entities inspect each change request for correctness with regards to contents and standards to ensure the high quality of eCl@ss. Each change request has to meet formal criteria including general naming principles[17] which are inspected upon receipt by the eCl@ss office. The required foundation is developed by the Structure & Technology expert group. The office forwards the change requests to the responsible expert groups (usually one for each segment) that consist of specialists of the industry itself (manufacturers, retailers, sellers, buyers and customers, everyone can participate, not only members), i.e. the standard is industry-driven. The content is inspected with regards to correctness and conformity to the eCl@ss standards (ISO 13584, IEC 61360, DIN 4002 etc.). Properties are compared to those in the DIN property server (German National Standardization) and applications are made for new properties if necessary. The final inspection consists of the quality committee checking each application with regard to eCl@ss conformity. The detailed process diagram is shown in Figure 8.

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[13] www.eclassdownload.com
[14] see CWA 15295:2005, p. 35ff.
[15] www.DINsml.net
[16] www.eclass-serviceportal.com
[17] Quick_guide_eclass_change_requests_v1.0

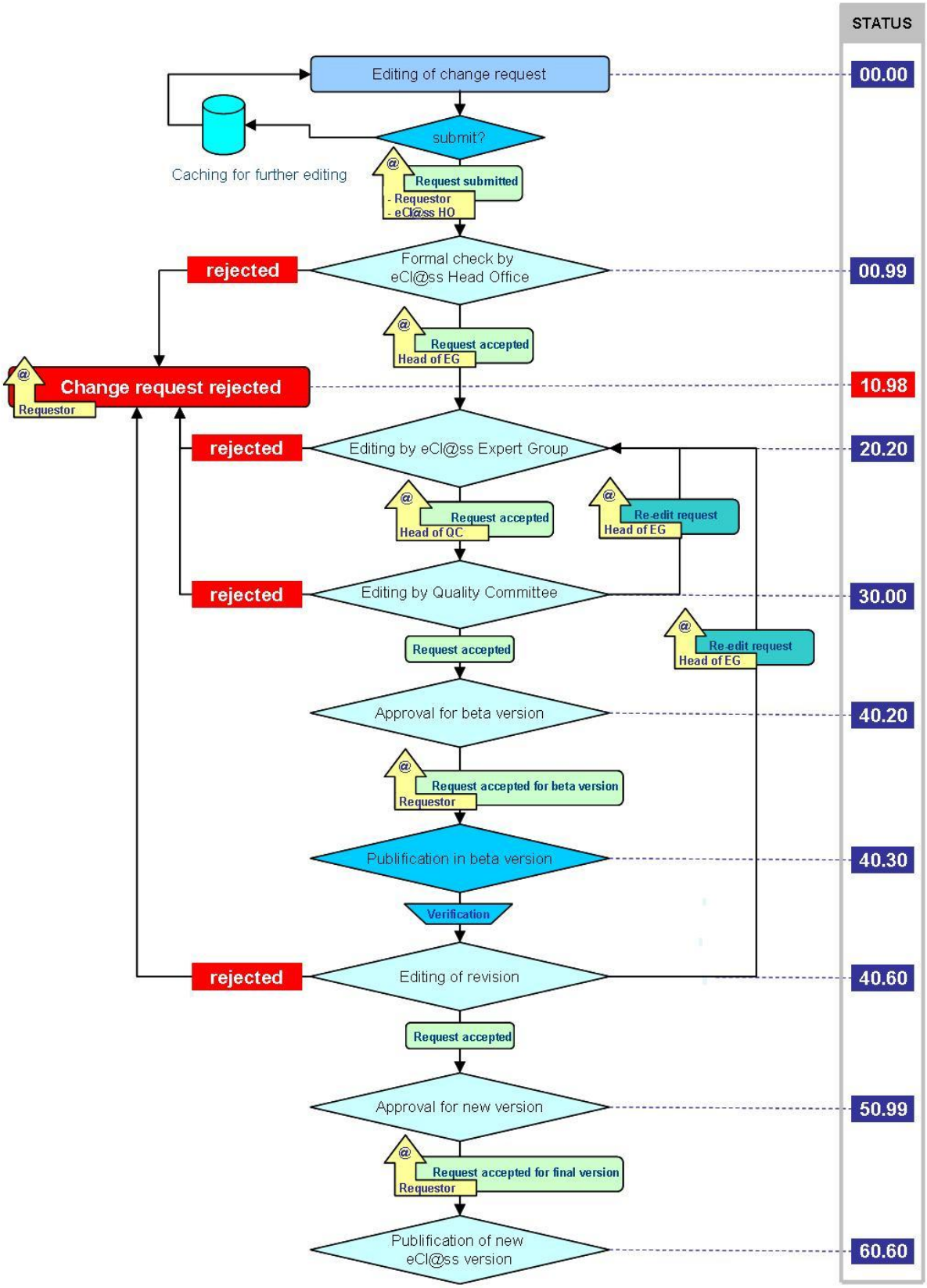


Figure 8 - eCl@ss Change Process Diagram

Tool-assisted development process

With the eCl@ss ServicePortal a powerful tool to develop the eCl@ss standard has been introduced. It has three core functionalities and serves as:

- the central front end, available online 24/7, so that every registered requestor worldwide can submit change requests and contribute to the development of the eCl@ss standard;

- the central workflow platform for all eCl@ss bodies involved in the development process;

- the central database, which includes all versions and language variants of the standard.

Everybody can register and use the eCl@ss ServicePortal and have a view on the current draft version of new or edited structural elements on the ServicePortal. The process is the same as shown above in Figure 8. Figure 9 shows a screenshot of the eCl@ss ServicePortal. From left to right you can see

- a navigation menu that leads the requestor through his change requests, in this case “Create Classification Class”;

- the eCl@ss structure tree to place the request in the right hierarchy, in this case in segment 22 “construction technology” the new commodity class 22-36-09-03 “Pipe clamp (sanitary)”;

- the change request details on the right side including all text fields, in this case in English (mandatory) and German.

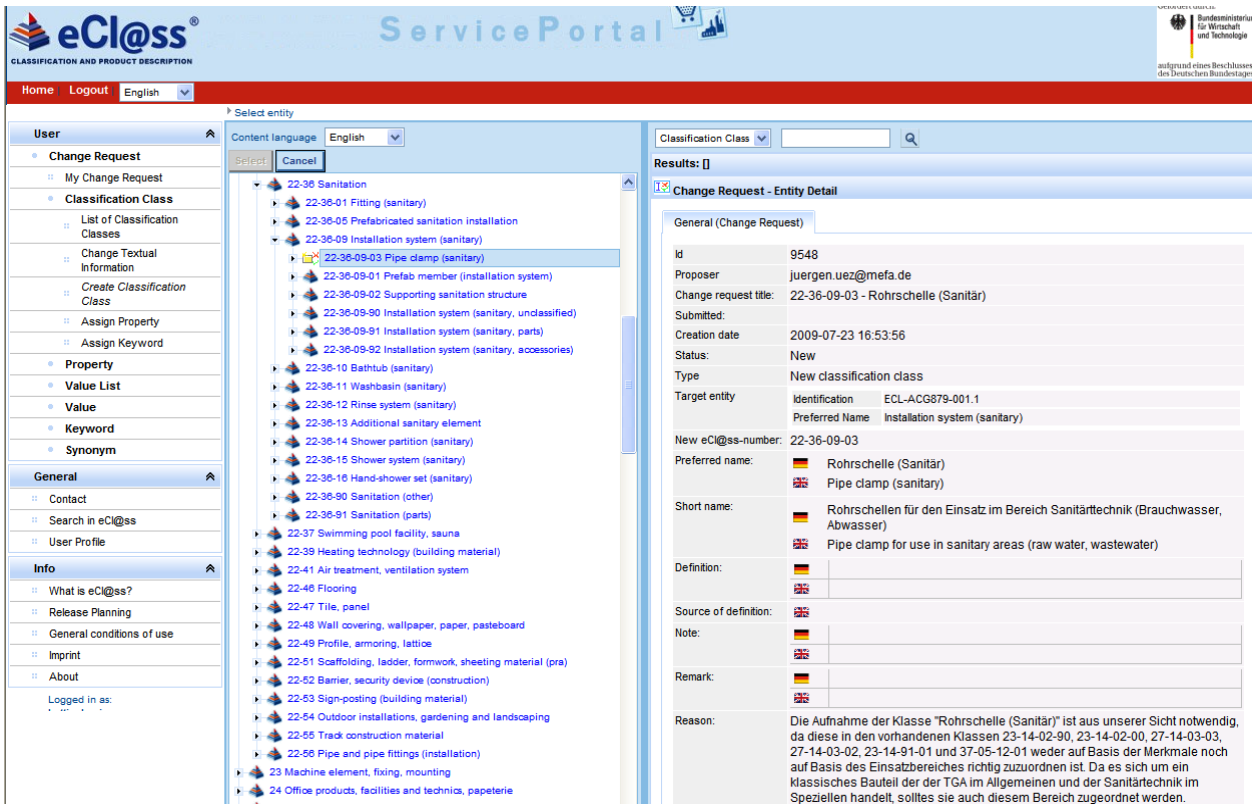


Figure 9 - The eCl@ss ServicePortal

4.2.8 Conditions of use

The eCl@ss standard is visible for free on the eCl@ss website, where a search function is implemented as well. The current draft working version is visible on the eCl@ss ServicePortal (see above, 4.2.7).
As the eCl@ss standard shall be available to all companies the moderate fees for the downloadable versions are graded according to the size of the company, measured by counting the number of employees.

By paying a moderate download fee, all users of eCl@ss make a small contribution towards the further development of eCl@ss according to the requirements of the industry and towards an acceleration of its national and international distribution and standardization.

The download fees are intended to support the further expansion, internationalization and standardization of eCl@ss. The prices depend on company size and are designed to take into account the individual economic status of eCl@ss users. Registration and acceptance of the Conditions of Use are required in every case.

To use the eCl@ss standard and incorporate it into their systems, each user has to be registered. Special licence agreements are made with software service providers[18]. Details are included in the conditions of use, attached in the annex[19].

product	Companies ≤ 500 employees	Companies 501 ≤ 1000 employees	Companies 1001 ≤ 10.000 employees	Companies > 10.000 employees
First purchase of a full version	400 €	600 €	1.200 €	5.000 €
Purchase of another version*	100 €	250 €	600 €	1.500 €
Purchase of a Servicepack*	0 €	0 €	0 €	0 €

* if another version in the same language and with the same Major-Release Number (e.g. 6.xx) was purchased before or is purchased at the same time.

Figure 10 - eCl@ss price list version 4.0

[18] A compatible exchange format for the eCl@ss standard is e.g. BMEcat (based on XML, widely used in German-speaking countries). For German SMEs a free-of-charge online tool to test the compatibility of one's data according to eCl@ss and BMEcat is available on the German website http://www.eclass-katalogvisualisierung.com.

[19] eclass_cond_use_vers_2_0_en.pdf.

For members of the eCl@ss e.V. association there are certain benefits:

- For ordinary members the downloads of all eCl@ss-versions in English, German and French are available in the internal eCl@ss forum as well as one more free chosen language from the DownloadPortal are free of charge. Prices for additional languages (on demand) are reduced.
- For supporting members the download of one language version to choose according to the offer in the DownloadPortal is free of charge.
- Special arrangements will be made with the eCl@ss head office concerning corporate licenses, service and application providers as well as for the demand of a permanent license.

The eCl@ss standard is available in .csv-format (comma separated values) in UTF8-code, so that every language can be displayed. The csv-format can easily be imported into any database or calculating software, like e.g. MS EXCEL©. With the next eCl@ss major release 7.0, an XML-version will be available for the first time. The current eCl@ss-csv-version consists of the following six tables:

eClass6_1_CC_en.csv	=	Table of Classification Classes
eClass6_1_PR_en.csv	=	Table of Properties
eClass6_1_VA_en.csv	=	Table of Values
eClass6_1_KW_en.csv	=	Table of Keywords
eClass6_1_CC_PR_en.csv	=	Relations Classes-Properties
eClass6_1_PR_VA_en.csv	=	Relations Properties-Values

Each structural element is identified with a globally unique identifier, which serves as the primary key for the relation between different elements, such as classes and properties (see Annex for details of all attributes of the structural elements and their relations).

All released complete eCl@ss versions are available in the DownloadPortal[20]. Starting with the 6.2 release, eCl@ss will make available all language versions and publish the degree of translation.

4.2.9 Intended purpose

eCl@ss has the goal to be a common language for eBusiness processes, such as:

- for searching & finding within ERP- / procurement – systems
- for a unified Product Data Management (PDM) and Master Data Management
- for representing the content of catalogues, online shops and marketplaces
- for material logistics, storage/warehousing
- for computer aided engineering (CAE/CAx)
- for the use in all business processes - in the complete product lifecycle

The eCl@ss standard is readable for man and machine (computer applications). It is driven by the industry itself and supports all business processes along the supply chain and throughout the product life cycle. It offers a unified interface for data transfer and reflects the structures of the distribution and buying markets by providing a classification. It reflects comparable technical properties for product description and identification.

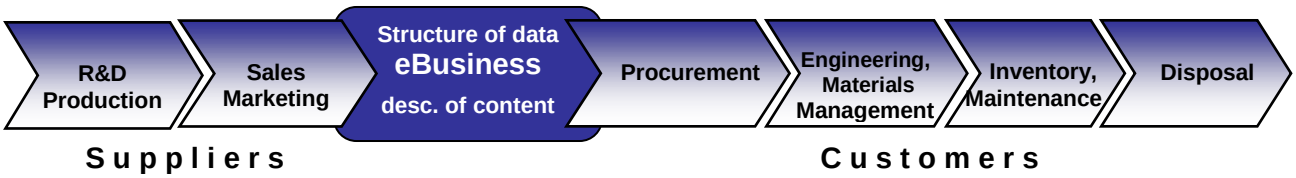


Figure 11 - eCl@ss for the whole product supply chain

[20] www.eclassdownload.com

To give the reader an idea of the application of the eCl@ss standard, the following figures show the origin countries of eCl@ss downloaders besides Germany (Figure 12) and the origins and industrial sectors of the members of the eCl@ss association (Figures 13 and 14).

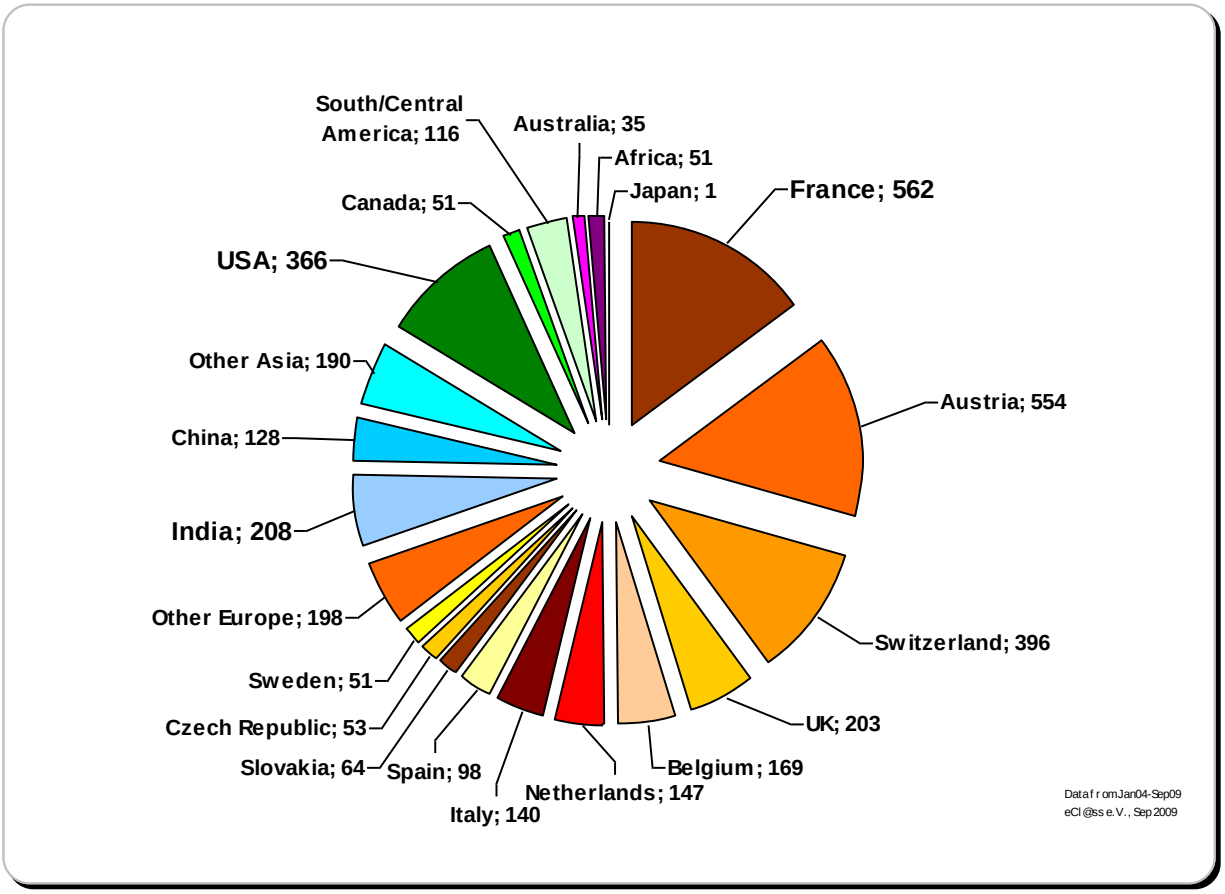


Figure 12 - eCl@ss downloads (excluding Germany, 25% of total)

Since the launch of the eCl@ss DownloadPortal, the eCl@ss standard has been downloaded more than 15,000 times. About 75 % of all downloads in this period have been done from Germany. This is because the eCl@ss standard is supported and promoted by the German Federal Ministry of Economics and Technology (Bundesministerium for Wirtschaft und Technologie[21]) in a project to support small and medium-sized enterprises (SME's, project "eCl@ss für den Mittelstand"[22]). Further, as shown in Figure 4 the eCl@ss standard is always updated in English and only German, which is why release 5.1.2 was the most common release. A lot of companies stay with one version, as the upgrade to a new release causes a lot of work. Figure 12 shows the remaining 25 % (ca. 3,800) of all total downloads excluding Germany.

[21] www.bmwi.de

[22] http://www.eclass.de/eCl@ss-für-den-Mittelstand/Projektbeschreibung/3705,de.html

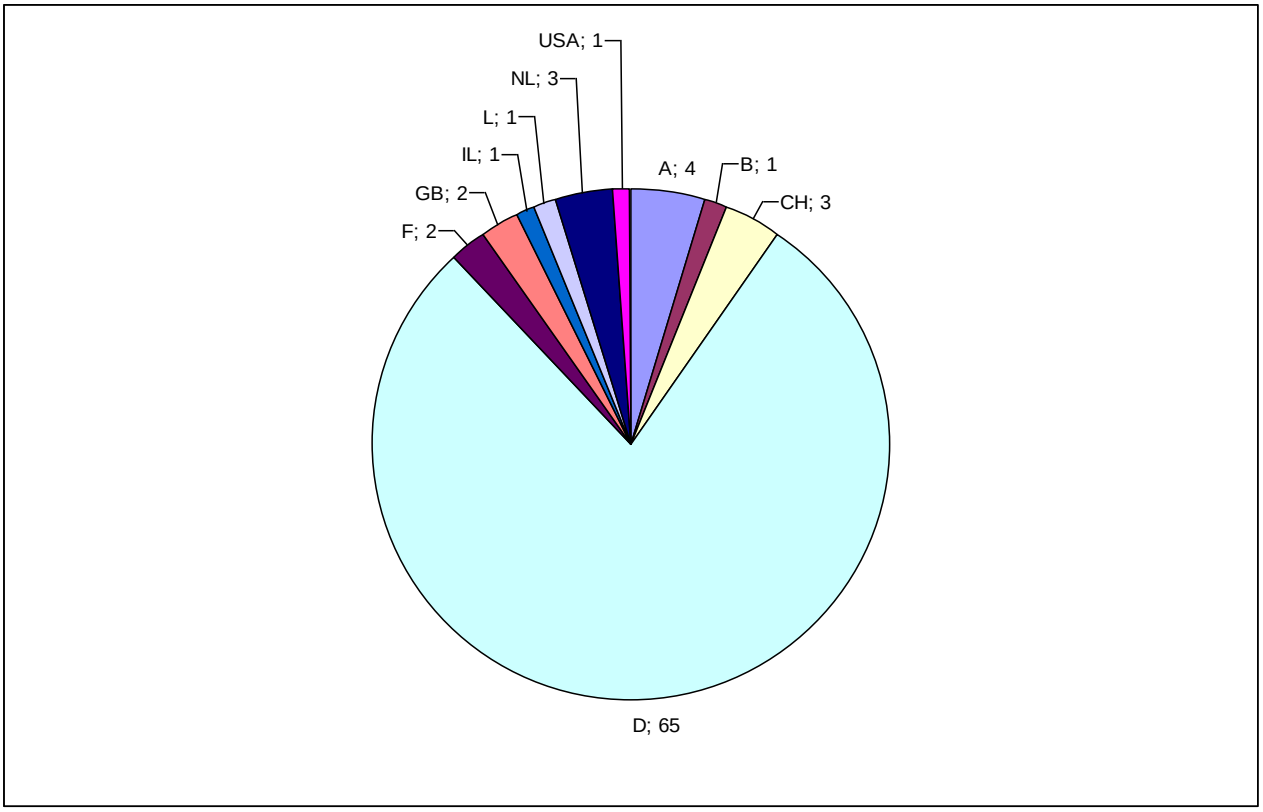


Figure 13 - eCl@ss association: origin of members (n=80)

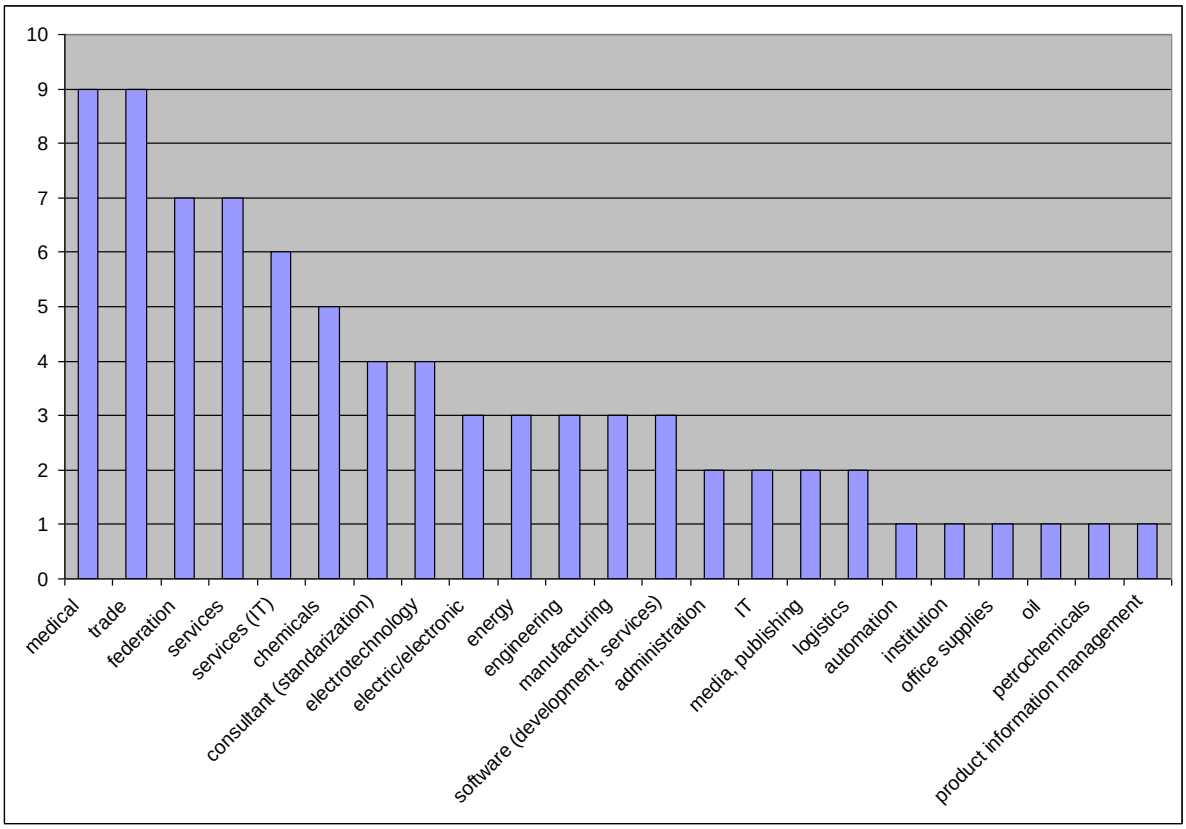


Figure 14 - eCl@ss association: sectors of members (n=80)

4.3 GS1 GPC – Global Product Classification and nomenclature

4.3.1 History

In 1999, the VICS board authorizes the development of a Product Classification Standard. VICS is the Voluntary Interindustry Commerce Solutions Association, a North American Industry-driven body that develops solutions to improve efficiency and effectiveness in the supply chain. The same year, the UCC Board (now it is GS1 US) approved the Product Classification Project. The two initiatives merged to develop the Food & Beverage classification segment. In 2001, the initiative became truly global with GS1 accepting governance as global project.

GS1 is a neutral, not-for-profit organisation dedicated to the design and implementation of global standards and solutions to improve the efficiency and visibility in supply chains. GS1 is driven by more than a million companies, who execute more than six billion transactions a day with the GS1 System of Standards. GS1 is truly global, with local Member Organisations in 108 countries, with the Global Office in Brussels, Belgium.

GPC comprises:
- 36 Segments
- 84 Families
- 453 Classes
- 2,857 Bricks
- 4,405 Brick Attributes
- 14,333 Brick Attribute Values

A new release is published in May/June 2010.

GPC – is available in English, French, Hungarian, Japanese and Serbian. Five other languages (Dutch, German, Russian, Spanish and Swedish) are coming up shortly[23].

Table 2 - GPC levels

Level	Length		Example
Segment codes	8		10000000
Family codes	8	preceded with the Segment code	10200000
Class codes	8	preceded with the Family code	10203000
Brick codes	8	preceded with a “1”	10000123
Attribute Type codes	8	preceded with a “2”	20000123
Attribute Value codes	8	preceded with a “3”	30000123

The main users of GPC are the GS1 Global Data Synchronisation Network (GDSN) users. The GPC Brick is a mandatory code for GDSN.

The GDSN is built around the GS1 Global Registry®, GDSN-certified data pools, the GS1 Data Quality Framework and GS1 Global Product Classification, which when combined provide a powerful environment for secure and continuous synchronisation of accurate data.

With GDSN, trading partners always have the latest information in their systems and any changes made to one company's database are automatically and immediately provided to all of the other companies who do business with them.

When a supplier and a customer know they are looking at the same accurate and up-to-date data, it is smoother, quicker and less expensive for them to do business together. The GDSN provides a single point of truth for product information.

The list of users - over 24.000 in May 2010 - is published in the GS1 website.

[23] http://www.gs1.org/gsmp/kc/gpc

GPC is used in the following applications:

- GDSN related processes (publication, subscription, synchronisation)
- New product introduction
- A global interface between business partners.
- All externally facing communication that references product categories, (Point of Sale, Product specs, Price lists, Inventory, Shipment data etc.)
- Master Data Management – Product Information Management
- Control and Uniformity across the organisation – corporate taxonomy
- Enabling Category management
- Measuring Sourcing value to support procurement
- Strategic Sourcing

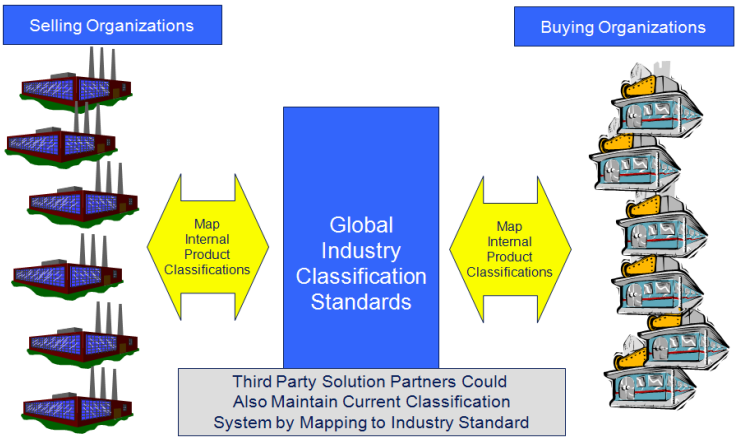


Figure 15 - The GPC code as an interface tool

4.3.2 Statistics about usage

The latest statistics show the distribution of the GPC segments among industries as follows:

Table 3 - Statistics about GPC usage

Industry Segment	Number of products	%
Food Beverage and Tobacco	738 426	28
Beauty/Personal Care/Hygiene	480 763	18
Building Products	216 158	8
Clothing	148 870	6
Lawn/Garden Supplies	136 592	5
Homecare	127 605	5
Household/Office Furniture/Furnishings	72 015	3
Healthcare	71 821	3
Plumbing/Heating/Ventilation/Air Conditioning	71 644	3
Electrical Supplies	60 420	2
Household Kitchen Merchandise	55 789	2
Pet Care/Food	54 594	2
Baby Care	50 308	2
Arts/Craft/Needlework	49 751	2
Audio Visual/Photography	45 834	2
Personal Accessories	44 287	2
Stationery/Office Machinery/Occasion Supplies	34 652	1
Sports Equipment	29 964	1
Toys/Games	29 486	1
Textual/Printed/Reference Materials	28 106	1
Home Appliances	26 990	1
Automotive	14 184	1
Tools/Equipment – Hand	12 649	0
Tools/Equipment – Power	11 447	0

Industry Segment	Number of products	%
Footwear	10 152	0
Computing	5 430	0
Camping	4 089	0
Safety/Security/Surveillance	3 167	0
Safety/Protection – DIY	2 988	0
Communications	2 807	0
Cross Segment	2 702	0
Lubricants	1 414	0
Tool Storage/Workshop Aids	1 204	0
Fuels	889	0
Live Animals	341	0
Temporary classification	1 076 320	28,9

GPC is increasingly adopted, used and translated in multiple languages and offer a common language.

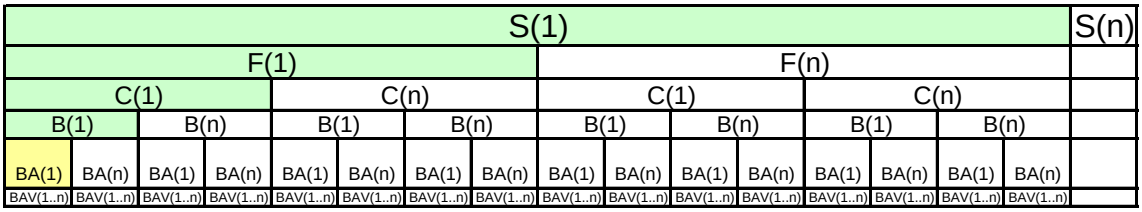
4.3.3 Structure

GPC is a hybrid hierarchical system such that comprises four + one level:

- Segment
- Family
- Class
- Brick
- Brick variant

The higher levels have control or precedence over the lower levels. The GPC schema has 4 levels in its hierarchy (Segment, Family, Class and Brick) providing a coherent, logical and intuitive grouping that can be used to classify comparable products in a global environment. Each level is governed by business rules and/or principles and is intended to aid search functionality by using standard naming conventions, non-culturally biased terms and spellings and ensuring unique placement of products within the schema. Each node within the schema is designated with a Code and Description pair. The Code provides a unique reference while the Description aids human readability. Either the Code or Description can be used for searching, filtering or referencing.

The lowest level in the hierarchy, Brick, has a level beneath it called Brick Variant (Brick Attribute to which Brick Attribute Values are allocated). Brick Attributes or Values are not included in the hierarchy, as they cannot be aggregated to higher levels. Brick Attributes are only relevant to the Brick they are assigned to. Brick Attribute Values are only relevant to the Brick Attribute they are assigned to.



Legend:
S = Segment, F = Family, C = Class, B = Brick, BA = Brick Attribute, BAV = Brick Attribute Value

Figure 16 - GPC structure

Segment: The first and highest level of the GPC hierarchy is a logical grouping of Families sharing similar characteristics. The Families contained in a Segment are logical and coherent aggregations.

Family: The second level of the GPC hierarchy is a logical grouping of Classes sharing similar characteristics. The Classes contained in a Family are logical and coherent aggregations.

Class: The third level of the GPC hierarchy is a logical grouping of Bricks sharing similar characteristics. The Bricks contained in a Class are logical and coherent aggregations.

Brick: The fourth, lowest and most detailed level of the hierarchy is a logical grouping of similar products that conform to the Brick business rules. A Brick code is a classification key and will contain a group of products that serve a common purpose. They are processed to similar methods, are used and applied in a similar manner, are of a similar form and material and as far as practical contain products that can be **characterised by the same set of Brick Attributes relevant to the product.** Very specific groupings of products can thus be identified by the combination of a Brick and a collection of Brick Attributes with specific Brick Attribute Values.

There is no rule in GPC for segment and family names. There are only uniqueness rules that apply for brick names. Brick names are always plural.

Brick Attributes represent particular category features of the products assigned to the same Brick. Brick Attributes may be assigned to more than one Brick.

Brick Attribute Value: Each Brick Attribute will have a set of unique, objective and mutually exclusive Brick Attribute Values associated with it.

Classification with GPC is the act of saying:

- This particular product belongs to that category (Brick);
- This Brick is part of the upper level hierarchical elements (->Class->Family->Segment);
- This Brick can be further characterised by several Brick Variants (Attribute – Brick Attribute Value pairs).

- **SEGMENT : 60000000 - Textual/Printed/Reference Materials**
  - **FAMILY : 60010000 - Textual/Printed/Reference Materials**

    CLASS : 60010100 - Textual/Printed/Reference Materials Variety Packs
    CLASS : 60010300 - Periodicals
    CLASS : 60010400 - Maps

    - **CLASS : 60010200 - Books**

      BRICK : 10004103 - Audio Books
      BRICK : 10004107 - Books Variety Packs
      BRICK : 10000925 - E–books/Electronic Text

      - **BRICK : 10000926 - Printed Books/Compositions**

        DEFINITION : Includes any products that can be described/observed as a written work published in printed form. Includes paperback books, hardcover books, rag books, and leaflets. The book content ranges from non-fiction subjects such as biographies and music instruction to fictional thrillers and romantic novels. Excludes products such as Electronic Books and Periodicals.

        - **ATTRIBUTE TYPE : 20000045 - Consumer Lifestage**

          DEFINITION : Indicates, with reference to the product branding, labelling or packaging, the descriptive term that is used by the product manufacturer to identify the period or stage in the consumer's life during which the product is considered to be suitable.

6 Brick Attribute Values

- ATTRIBUTE VALUE : 30000147 - ADULT
  ATTRIBUTE VALUE : 30000164 - ALL AGES
  ATTRIBUTE VALUE : 30000628 - CHILD
  ATTRIBUTE VALUE : 30010989 - TEENAGER/YOUNG ADULT
  ATTRIBUTE VALUE : 30002515 – UNCLASSIFIED
  DEFINITION : This term is used to describe those product attributes that are unable to be classified within their specific market;
  ATTRIBUTE VALUE : 30002518 - UNIDENTIFIED
  DEFINITION : This term is used to describe those product attributes that are unidentifiable given existing or available product information.

4 Brick Attribute Values

- **ATTRIBUTE TYPE : 20000811 - Content/Subject**
  DEFINITION : Indicates, with reference to the product branding, labelling or packaging, the descriptive term that is used by the product manufacturer to identify the subject of the textual content.
  ATTRIBUTE VALUE : 30007070 - FICTION
  ATTRIBUTE VALUE : 30007071 - NON FICTION
  ATTRIBUTE VALUE : 30002515 - UNCLASSIFIED
  ATTRIBUTE VALUE : 30002518 – UNIDENTIFIED

13 Brick Attribute Values

- **ATTRIBUTE TYPE : 20002048 – Format**
  DEFINITION : Indicates, with reference to the product branding, labelling or packaging, the descriptive term that is used by the product manufacturer to identify the product format.
  ATTRIBUTE VALUE : 30010998 - BATH BOOK
  ATTRIBUTE VALUE : 30010994 - BOARD BOOK
  ATTRIBUTE VALUE : 30010992 - HARDCOVER/HARDBACK
  ATTRIBUTE VALUE : 30010996 - LEATHER/FINE BINDING
  ATTRIBUTE VALUE : 30010999 - LOOSE LEAF
  ATTRIBUTE VALUE : 30010990 - PAPERBACK/SOFTBACK
  ATTRIBUTE VALUE : 30010997 - RAG BOOK
  ATTRIBUTE VALUE : 30011000 - SINGLE SHEET/LEAFLET
  ATTRIBUTE VALUE : 30010995 - SPIRAL BOUND BOARD BOOK
  ATTRIBUTE VALUE : 30010993 - SPIRAL BOUND HARDCOVER
  ATTRIBUTE VALUE : 30010991 - SPIRAL BOUND PAPERBACK
  ATTRIBUTE VALUE : 30002515 - UNCLASSIFIED
  ATTRIBUTE VALUE : 30002518 - UNIDENTIFIED

- ***I.e. The Brick: 10000926 Printed Books / Compositions represents:***
  6 * 4 * 13 = 312 Brick Variants
- 1 of the 312 Brick Variants could be characterized as follows:
  Consumer Lifestage = Adult; Content / Subject = Fiction; Format = Hardcover / Hardback

Figure 17 - GPC brick example

A brick attribute can be used by more than one brick. For example, the attribute coded 20001148 Screen Size can be used with Brick identified with code 10001402 Televisions – Hand-held and by Brick 10001420 Portable DVD players.

4.3.4 Release policy

Since GPC is the mandatory classification standard for GDSN the GPC publication releases are aligned with the GDSN Maintenance Releases. The dates have not been standardized yet, but the trend is to publish GPC twice a year (in spring and in autumn).

On the GS1 website there can be two versions available, the most recent version and the version that is used in production in GDSN. Currently (end June 2009) the most recent version and the 'GDSN production version' are identical.

4.3.5 Release roadmap

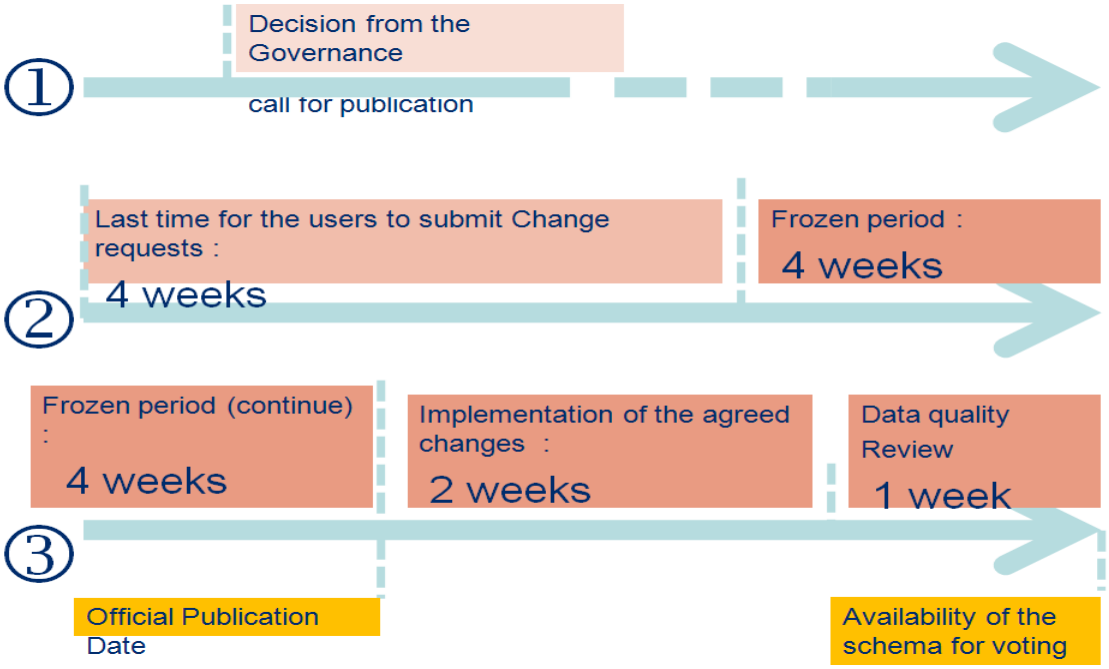


Figure 18 - GPC Release roadmap

4.3.6 Version compatibility

Delta reports between two consecutive releases are available for all updates.

Companies can use several versions, however to achieve master data synchronisation the GDSN users should migrate to the GDSN version practically 1 / 2 times a year.

4.3.7 Developing process

Any individual, company or organisation may submit CRs. The on-line Change Request Form can be accessed through the GSMP website[24]

The standard form 'GLOBAL STANDARDS MANAGEMENT PROCESS (GSMP) CHANGE REQUEST' is used to initiate the change management processes for the GPC in GSMP. GSMP is the organization where change requests to GS1 standards are processed.

[24] http://cr.gs1.org/changerequest/login.cfm?CFID=38827&CFTOKEN=18070049

The objective of the GSMP is to bring together users from all industries, from anywhere in the world, to allow for a uniform approach and methodology for global standards management. This includes, but is not limited to, standards development, standards maintenance, and implementation support.

A change request in GPC can refer to initiate a complex new segment development or deal with ongoing maintenance. The GPC components that can be affected are Hierarchy Structure (Segment, Family, Class and Brick), a brick, a brick Attribute, Brick Attribute Value or Documentation.

The change request process for GPC consists of five steps:

1. Statement of Business Need (what is the intended usage area)
2. Requirements Gathering & Analysis (the change request becomes a work order and the gathering of the business requirements begins. The business requirements are documented and analyzed)
3. Business Solution Design (GPC has a centralized Governance mechanism and uses the same rule set for every new industry sector)
4. Technical Solution Design – Single data model for every segment
5. eBallot – voting mechanism to migrate to a global standard

4.3.8 Conditions of use

The GPC standard is downloadable to all companies without usage restrictions.

The file formats are as follows:

- The schema in xml, txt and xls
- Info sheets in doc
- Visual map in xls
- Delta report in xml and xls.

They can be downloaded. [25] .

[25] http://www.gs1.org/gsmp/kc/gpc

4.4 UNSPSC

4.4.1 History

The UNSPSC was started in 1998 by Dun and Bradstreet as the proprietary code set called the SPSC (Standard product & Services Code). In 1998 it was merged with the United Nations Development Programme's UNCCS (United Nations Commodity Coding System). It has been managed under contract by GS1US. GS1US is a non-profit organization.

In support of membership the UNSPSC also offers different versions that have been translated into Hungarian, German, French, Spanish, Italian, Dutch, Portuguese, Danish, Norwegian, Swedish, Japanese, Korean, Chinese Simplified and Traditional.

The latest version of the UNSPSC (11-05-01) has 40,289 entries consisting of 55 Segments, 3838 Families, 3057 Classes and 36,794 commodities.

4.4.2 Intended purpose

The intended purpose is to enable electronic commerce and provide the foundation for spend analysis.

4.4.3 Structure

The UNSPSC is a hierarchical code set with 4 Levels Segments, Families, Classes and Commodities. An example of a printer toner cartridge is shown in Figure 19.

A Segment is a logical grouping of families sharing similar properties or characteristics. It is the highest classification level in the UNSPSC code set. Its definition includes what categories of commodities it contains and what categories it does not contain, thus creating a subject boundary differentiating it from other Segments.

A Family is a logical grouping of classes sharing similar properties or characteristics. It is the second highest classification level in the UNSPSC code set. Its definition includes what categories of commodities it contains and what types of categories of commodities it does not contain, thus creating a subject boundary differentiating it from other families.

A Class is a logical grouping for commodities sharing similar essential properties or characteristics. It is the third highest classification level in the UNSPSC code set. Its definition includes what types of commodities it contains and what types of commodities it does not contain, thus creating a subject boundary differentiating it from other classes.

A standard dictionary definition of a Commodity is "a thing of use or advantage to humankind; especially in useful products, material advantages, elements of wealth". For the UNSPSC, both goods (products) and services are included in this definition. Traditional Commodity identification consists of a lead **Noun** and, usually but not always, a **Modifier** that clearly defines a Commodity.

It is commonly seen that classification standards approaches to the same Commodity, even within the same industry vary. While each approach may respond to different user community needs, likewise each approach reflects the limitations imposed by those needs. These same differences should be considered as an eloquent illustration of the increasing need for,

1. Intra – as well as inter – industry collaboration
2. A global reference classification framework.

Key aspects of the UNSPSC classification process include the following:

3. Determine the relationships between commodities based on their essential properties and assign them to categories.

4. Determine the logical relationship between categories based on the Commodity types they contain and create new categories to accommodate new Commodity types.
5. Determine the congruence of UNSPSC commodities and Class, Family and Segment categories to other leading industry and international classification systems with the goal of reconciling differences, fostering collaboration and strengthening UNSPSC's role as a global reference framework.

The UNSPSC classification process embodies a "bottom-up" approach, e.g., Class, Family and Segment structure is based on accurate Commodity identification which we believe best reflect marketplace realities.

Segment **44**000000 *Office Equipment and Accessories and Supplies*

Family 44**10**0000 *Office machines and their supplies and accessories*

Class 4410**31**00 *Printer and facsimile and photocopier supplies*

Commodity 441031**03** *Toner*

44103103 = *Toner*

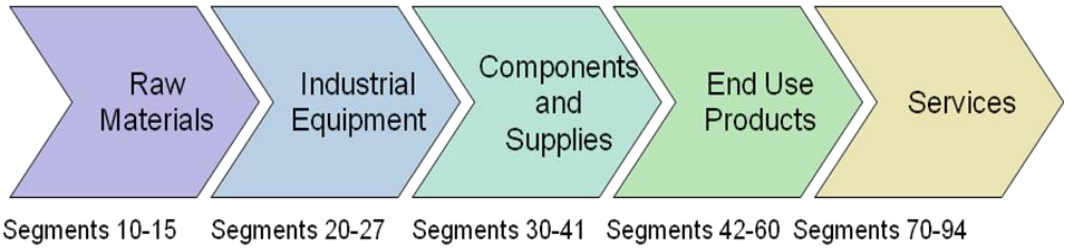
Figure 19 - Example toner UNSPSC code

All 4 levels of the codes use an 8 digit integer. There is applied intelligence to the numbering scheme. The number of trailing zeros indicated the level of hierarchy you are on:

- trailing zeros means you are at the segment level
- or 5 trailing zeros means you are at the family level
- 2 or 3 trailing zeros means you are at the class level
- 1 or no trailing zeros means you are at the commodity level

The listing of Segments appears in Figure 20.

The 55 Segments are arraigned in a logical sequence that reflects how value is progressively added to products.



Family, Class and Commodity codes are arbitrary, and reflect no logical sequence.

Figure 20 - UNSPSC segments

**** The current version being prepared for vote will carry a new Segment of Land, structures and thoroughfares. All codes have a name and definition.

4.4.4 Release policy

The UNSPSC is updated and released 2 times per year. The version is released in PDF for the general public and in Excel format for members. The excel version also includes an audit trail that documents changes in the version released.

A new version becomes usable when it is released. The versions live on and people can continue on a version as their need dictate or update to a newer version when warranted.

4.4.5 Release roadmap

As there is a standardize release schedule of 2 times yearly the roadmap is flexible and depends mostly on industry and government need. There has been a huge interest by the US and other governments in the past couple of years. It is projected that this will continue. Depending on the agencies involved currently major increases in numerous segments are expected. Numerically each release for the next 3 years is expected to average between 2 000 and 4 000 new entries per version. In the past 5 years the largest release contained some 12,000 plus new entries in segment 50 (foods)

4.4.6 Version compatibility

As the components of the UNSPSC are standardized backward compatibility is always guaranteed. Forward compatibility is guaranteed for the portions of the release that centre on codes added. On codes that are modified, edited or deleted a remapping process is required if a member wishes to upgrade to that version.

The audit trail provided in the excel format of each release includes version parameters as to when an entry was originally added when it was last changed and or when it was deleted.

4.4.7 Development process

Individual request can be made by members and occasionally groups of members require that major rework in a segment must be done to sustain industry consensus. These projects are called Segment reviews and are accomplished by making all of the members interested in the segment aware of the review. The members have the ability to participate.

Once consensus is reached, the candidate requests are prepared for vote by the membership.

Generally the interested group of members approach UNSPSC and then participation is offered to all members who vote in that segment and go from there.

Those requests that pass the vote are collected for a back end review. The back end checks that the work and the initial review were done correctly and often surfaces questions of interpretation. There is a 3 node (approval, vote, and review by a third party) system to try and insure maximal quality by a different ontologist and then all codes that have been approved in vote and have been approved by the back end ontologist are collected and included in the new version of the code set.

Members make requests through the website, the above detailed process is all accomplished through a secure application within the website it is called CatMaster.

4.4.8 Conditions of use

The UNSPSC is an open domain and royalty free code set. There is no charge for obtaining or using the code set.[26].The UNSPSC is published in English.

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[26] www.UNSPSC.org

The UNSPSC is the dominant Code set globally embedded in software. Companies like SAP, Oracle, IBM and a myriad of others provide a Version of the UNSPSC inside their software. This is not prohibited by the UNSPSC.

The UNSPSC does offer access to a repository of all versions of the UNSPSC as well as all versions with translations free of charge to members. Non-members can purchase either an older version or a specific translation for a nominal fee. It is majorly important to understand the purchase of the UNSPSC version or translation is not mandated by The UNSPSC business model. If the desired version or translation can be obtained from another source (such as a business partner) is not prohibited.

Any person or company found charging money for a version or translation of The UNSPSC will be dealt with legally. The case is the same for anyone representing the UNSPSC or any of its parts as their own product (standard intellectual property defence).

The Code set is available for free to anyone in PDF format. There is also a free code or keyword search available[27].

For different membership details, see http://www.unspsc.org/membership.asp

UNSPSC has over 5 000 members.

4.4.9 Statistics

In 2009 for the second year in a row there were at least 1000 code set downloads, in each of Europe, Asia, MEA (Middle East and Africa), Australia & New Zealand, and Africa.
For the third year in a row code set downloads outside the United States were greater than US downloads.

In 2009 US downloads were 42 % of all downloads which shows increasing global acceptance. Finally, the download statistics represents the direct channel of UNSPSC distribution. There are also a large number of software applications that include versions of the UNSPOSC inside each instance of their software. It is estimated this secondary channel of distribution represents a significant number but it cannot be accurately counted.

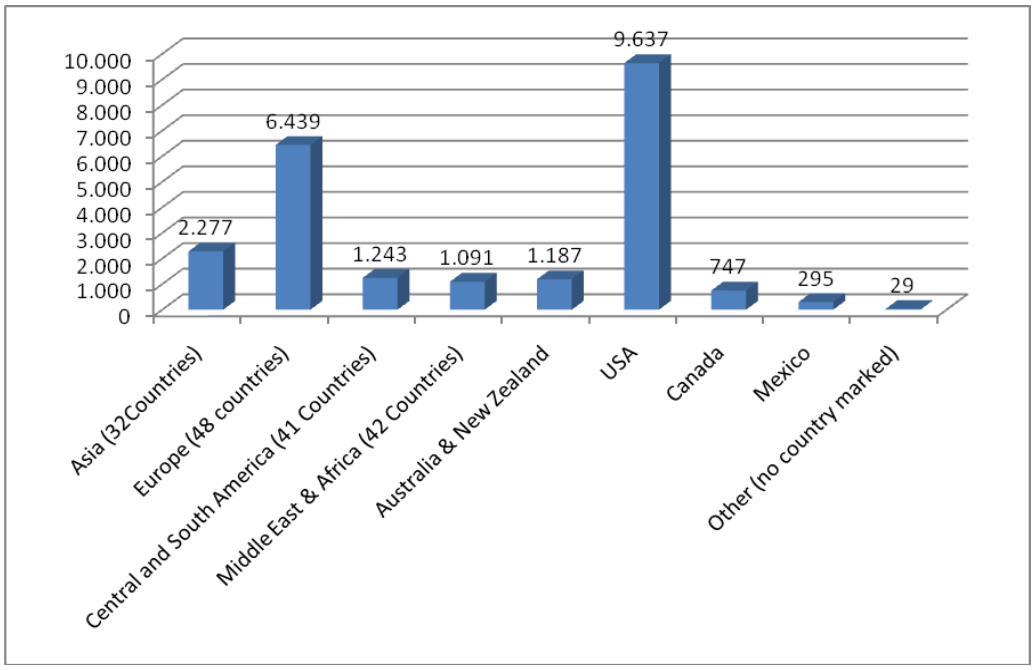

Figure 21 - UNSPSC Downloads in 2009

[27] www.unspsc.org

4.5 Concise summary of the four classifications

Table 4 - Concise summary of the four classification systems

Classification	Owner	Intended purpose	Structure	Release policy	Compatibility	Version(s) in use	Maintenance process	Conditions of use	Languages	Download formats
CPV		Tender process and information about public contracts in Europe.	5 levels + Complementary vocabulary to supplement the main vocabulary.	1 version every 3-4 years	No	Only one.	No change request process. Informal request system.	Free	22	PDF XML ODS XLS
eCl@ss	eCl@ss e.V.	All eBusiness processes along the supply chain (spend analysis, procurement, catalogues, product data management, CAx etc.)	4 levels + properties attached to 4th level. Product classified at lowest level only.	2 versions 1 year (minor releases) 1 version every 3-4 years	Transaction update files provided for MajorReleases. Minor releases are backward-compatible.	Any version is usable.	Change request process	Free on the website Download fee (depends on the company size and membership)	15 (different components)	CSV XML (in versions after version 6)
GPC	GS1 Global Office	Master Data Synchronisation (GDSN)	4 levels + Attribute – Attribute Value pairs.	2 versions a year	Backward Compatibility with Delta Reports (current vs. previous)	One version in GDSN. Any version otherwise.	Change request process	Free	5	XML TXT XLS
UNSPSC	UNDP	Electronic commerce Spend analysis	4 levels	2 versions a year	Backward compatibility	Any version is usable.	Change request process	Free for PDF Membership fee for XLS	15	PDF XLS

4.6 The NATO classification and eOTD dictionary, an insight

4.6.1 Background - eOTD - ECCMA Open Technical Dictionary

The eOTD is the first dictionary to be compliant with ISO 22745, (open technical dictionary). The eOTD contains terms, definitions and images linked to concept identifiers. The eOTD concept identifiers are used to create unambiguous language independent descriptions of individuals, organizations, locations, goods, services, processes, rules and regulations. The process of using concept identifiers from an external open technical dictionary is a form of semantic encoding compliant with the requirements of ISO 8000-110:2008 the International standard for the exchange of quality master data.

The eOTD concept identifiers are in the public domain. Using public domain identifiers as metadata creates portable data, data that can be legally separated from the software application that was used to create it.

The eOTD was developed with the support of the Defense Logistics Information Service (DLIS) an agency of the US Defense Logistics Agency (DLA), it contains concepts from International, National and Industry standards including over 400,000 concepts of class (approved item name), property (attribute), units of measure, currency and common enumerated value (days of the week for example). The eOTD does not include a class hierarchy or class-property relationships.

Companies use the eOTD to create data requirement specifications as Identification Guides(IG) or cataloguing templates. These Identification Guides contain the class-property relationships and are used for cataloguing, to measure data quality as well as to create requests for data or requests for data validation.

The eOTD is maintained by the [Electronic Commerce Code Management Association (ECCMA) Companies could use the eOTD class identifier as this allows them to analyze their expenditure according to their own or any of the classifications that they may be required to use in reporting such as the CPV in Europe.

- Use the ECCMA Open Technical Dictionary (eOTD) as the basis for the integration of classifications
- ECCMA can map a proprietary classification to the eOTD.
- Based on a catalogue and a classification, ECCMA Research staff will add a standard item name to the catalogue and create a map from the proprietary classification to any of the eOTD supported classifications

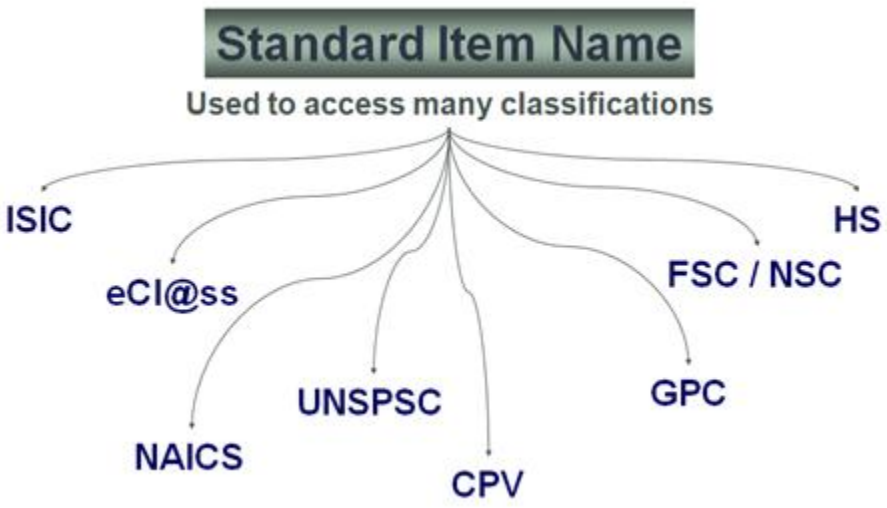

Figure 22 - eOTD standard item name

4.6.2 Recommendation

To validate the ECCMA concept is considered to be a very complex task. Conceptually the main purpose of the NATO Codification System (NCS) based ECCMA Open Technical Dictionary (eOTD) is to serve as the common vocabulary that can be used to define concepts in all of other classification schemas, however it is

NOT a classification system and it is NOT yet widely adopted in the private and public procurement commercial sector.

Another system should also be included in the assessment, the World Customs Organization (WCO) Harmonized System HS system. The HS system supports trade supply chain security, trade facilitation, Customs enforcement and compliance, anti-counterfeiting and piracy initiatives and integrated border management.

This approach could be considered in a separate project with the possible tasks as follows:

1. Investigate feasibility of the eOTD concept to support CPV in facilitating Procurement processes.
2. Establish relationship, as appropriate between CPV and Harmonized System(HS) of the WCO.

5 Comparative analysis of the classifications

5.1 Analysis at segment level

5.1.1 General

To compare the four different classification systems UNSPSC, eCl@ss, GPC and CPV, is not a simple task. The standards do have different structures which directly influence their content. In addition, the segments are not congruent. Therefore, a simple comparison of the segments was not sufficient. Further, it was necessary to take a “deep dive” into the classifications and partly go down to the fourth level. In addition to the original terms of reference, the CPV was included in the comparison, as a major goal of the CC3P project is to give advice to the CPV, which gaps need to be filled.

That is why the team decided that instead of just fulfilling the task named in the terms of reference “Identify missing domains in GPC and eCl@ss in relation with existing domains in UNSPSC,” it would be necessary to rather, “Identify missing domains in GPC, eCl@ss, UNSPSC and CPV in relation with existing domains in the other standards”, i.e. compare all standards with each other and find the superset, which is assumed to be the UNSPSC.

5.1.2 Major differences of the standards

The differences between the four standards are not only the number of segments and the number of classes included in each segment. The terminology is different and the types of included structural elements are different, e.g. the UNSPSC contains only classes, which might be a reason why this standard has more classes than all the other standards (see Figure 23). All the other standards work with other structural elements to further distinguish one single class, the GPC and eCl@ss both using values of the properties. eCl@ss is the only standard using keywords to help find or name a certain product class that might be described in different ways, the keywords not playing a further role in this section 5.1. The following figure shows the differences of the structural elements in use in the four standards.

	unspsc	eCl@ss	GPC	CPV
Segments (1st level)	55	27	36	45
Classes (4th level)	38,103 (“commodity”)	27,053 (“commodity classes”)	2,923 (“bricks”)	8,137 (“subcategories”)
Keywords	-	51,048	-	-
Properties	-	8,653 (“properties”)	1,669 (“core attributes”)	903 (“supplementary vocabulary”)
Values	-	6,811 (“values”)	9,053 (“core values”)	

Figure 23 - Differences of the standards

With the use of properties, a standard has the possibility to classify more products in one class and can further describe these classes in detail. Values represent a specific form of a product. A standard without characteristics has to multiply its number of classes, as it has no possibility to describe differences between similar products. The combination of classes and their description by characteristics and their specific values produces a much bigger granularity of describing information than a class system.

This directly results in the content of the standards. A comparison of segments is very superficial, as the number of classes contained in each segment may vary in a massive way depending on the structure of the

different classifications. To give a rough idea of the scope of the analyzed segments, the number of classes on the 4th level is mentioned nonetheless.

Example 1:
In the UNSPSC we find 18 different commodity classes for ropes in class 31151500, e.g.
31151502 polyester rope,
31151509 rubber rope or
31151512 polyethylene rope.
In eCl@ss a property "material" with a value list of 149 different values (e.g. polyester, rubber, polyethylene) is attached to only one class 23179106 "rope, string".

Example 2:
Classes such as "Dried organic lima beans" (50431834) and "Canned or jarred bok choy" (50463001) of the UNSPSC are described in the GPC in one single class:
- one class "Vegetables – Prepared/Processed (Shelf Stable)" (10000272)
- with attribute "Type of Vegetable" (20000209) with values
    - Lima Bean (30001435)
    - Bok Choy (30000394)
- with attribute "If Organic" (20000142) with values
    - "yes" (30002654) or
    - "no" (30002960)

Of course, both approaches have their limitations. eCl@ss theoretically covers the content of 149 UNSPSC rope-classes in one class, one property and a value list of 149 materials. The GPC covers the content of a much bigger variety of beans than the UNSPSC (all bean-related attributes and their values multiplied with each other will easily produce more UNSPSC-bean-classes than already exist). The UNSPSC multiplies the number of classes with the help of the information represented in properties and value lists in the GPC and eCl@ss.

However, it always depends on the users what best suites their purposes: an eCl@ss- or GPC-user has to make use of properties/attributes in his system to distinguish the content. A user that only uses classes in his system has to use the UNSPSC classes, e.g. to distinguish between all different kinds of ropes, as eCl@ss will only deliver one class. This way, the application of a standard might limit the choice of a standard.

Another big difference is the structure of services in the different standards:

- In the UNSPSC and the CPV, services are structured in several separate segments (in addition to the material-specific segments) with 19 service-segments in the UNSPSC and 21 in the CPV.
- eCl@ss does not have a consistent structure, as there is one segment "Services" including all kinds of different services of various markets, but construction services are included in the regular construction-segment. Furthermore, eCl@ss has certain product-specific services in all segments with the help of descriptive class codes (-95, -96-, -97-, -98- and -99-) related to the relevant commodity classes (e.g. codes xx-xx-98-xx for maintenance, codes xx-xx-99-xx for repair services or codes xx-xx-95-xx for training services).
- The GPC does not have any services which makes the comparison rather easy

Further, all standards are based on different classificatory principles which are not necessarily published. This makes it more difficult to understand, why a certain class is located at a certain point in the class hierarchy, when in another standard the same class would be at a different point[28].

Apart from the structural differences the standards have different application areas and purposes of use:

- The UNSPSC has a focus on spend analysis and procurement
- The GPC's main use areas are cross-referencing, data synchronization, catalogues, procurement
- The CPV is focused on public procurement
- eCl@ss has diverse target groups (procurement, catalogues, logistics, engineering/CAx and spend analysis), and wants to fulfil the requirements of different markets

[28] See chapters 5.3 and 6.2 for further details, as well as the recommendations section at the end of this chapter 5.1.5.1

Because of these major differences, a quantitative survey can only give a hint, but does not deliver an exhausting comparison of the content and the coverage of the different standards.

5.1.3 Analysis method

The main thesis underlying the project was that the UNSPSC covers more areas of the industry than all the other standards, i.e. it is the broadest classification standard.

The major goal of the analysis was then to identify the gaps in the other standards, i.e. to compare all the other standards to the content of the UNSPSC. Therefore the method was to find matching class areas in eCl@ss, the GPC and the CPV to the 55 segments of the UNSPSC that served as the basis.

The method included two steps:

Step 1: Segment-to-segment-comparison
On a first glance the names of all segments were compared to find matching items on the highest scale, which seemed to be the easiest thing to do. In very few cases a 1:1 relation could be identified comparing the segment names:

Example 1:
The UNSPSC segment “84: Financial and Insurance Services” corresponds without any doubt to the CPV segment “66: Financial and insurance services”. 92 classes of the UNSPSC segment are comparable to 71 classes of the CPV segment.

Example 2:
The by far largest UNSPSC segment “50: Food Beverage and Tobacco Products” (16,921 classes) is covered in every other standard:

- eCl@ss “16: Food, beverage, tobacco” (151 classes)
- GPC “50: Food/Beverage/Tobacco” (303 classes)
- CPV “15: Food, beverages, tobacco and related products” (431 classes)

In other cases, the names were slightly different, including more or less of what was meant in the original UNSPSC segment:

Example 3:
The UNSPSC segment “10: Live Plant and Animal Material and Accessories and Supplies” is covered in the GPC by “89: Live Animals”, but not all of it, as plants, accessories and supplies seem to be missing. 27 live animal classes of the GPC cover only a small part of the 236 classes in the UNSPSC segment #10.

Example 4:
The UNSPSC segment “14: Paper Materials and Products” with 119 classes is part of the eCl@ss segment “24: Office products, facilities and technics, papeterie” with 1561 classes. I.e. the eCl@ss segment contains a lot more than the UNSPSC segment.

In some cases, more than one segment in a standard would cover one UNSPSC segment:

Example 5:
The UNSPSC segment “12: Chemicals including Bio Chemicals and Gas Materials” with its 377 classes is certainly covered by the eCl@ss segments “38: Inorganic Chemicals” (1315 classes), “39: Organic Chemicals” (5112 classes), and some other sub-groups as “32-14: Chemical (inorganic, lab)” (129 classes), “32-15: Chemical (organic, lab)” (254 classes) and “32-16: Chemical (lab, other)” (35 classes).

Step 2: Segment-class-comparison
On a second glance, a more detailed comparison was done by identifying what was really the content of the UNSPSC classes. This was analyzed by a) the description of the UNSPSC segments and b) a brief overview of the sub-groups of all levels in the segment to get a detailed idea of what to look for in the other standards. Certain classes were used as keywords that were searched for in the other standards:

Example 6:
The UNSPSC segment “31: Manufacturing Components and Supplies” (2.099 classes) is (partly) covered in the eCl@ss sub-groups

- “33-14: Metallurgical plant, rolling mill, forge a. foundry (complete)” (131 classes)
- “18: Equipment f. mining, metallurgical plant, rolling mill a. foundry” (285 classes)
- “21-13: Standardized tool parts (tool, die and mold making)” (221 classes)
- “27-06: Cable, wire” (69 classes)
- “23: Machine element, fixing, mounting” (940 classes)

Here, e.g. the following keywords were included in the search: forge, forging, mill, cable, wire, mounting

5.1.4 Results of the analysis

5.1.4.1 General

First of all, the goal was to find matching areas to the 55 segments of the UNSPSC. How detailed the coverage of a certain segment is, can only be indicated on the basis of a comparison of possible classes matching to the segment. Especially because of the differences described in 5.1.2, a valid comparison of the real coverage of products cannot be delivered.

5.1.4.2 Coverage of segments: overview and number of commodity classes

The following Tables5 to Table 8 deliver a detailed overview of the particular segment coverage of each standard, showing the segment codes and names and the number of included commodity classes each. For statistical purposes also the minimum and maximum numbers of included classes are shown below each table, as well as the average and the median[29] of the class numbers as the distribution of classes is skewed in most standards (see results below the figures and comments).

E.g. the GPC and eCl@ss both have one segment each that does not contain real commodity classes but dummy classes. Their intend is not to describe a specific product class, but to enable an electronic exchange for products that are not yet classified in the standard. eCl@ss calls the one class in segment 90 the “Interim class (unclassified)”, the GPC calls it “58 cross segment” including the two classes “Temporary Classification” and “Cross Segment Variety Packs”.

The UNSPSC e.g. has a segment comprising only 36 commodities and another with almost 17,000, so that the average does not show the real picture. In order to show the skewed distribution these statistical numbers are delivered for each standard.

Table 5 - Segments of the UNSPSC

Segment Code	unspsc® Segment Description	Number of commodity classes
10000000	Live Plant and Animal Material and Accessories and Supplies	236
11000000	Mineral and Textile and Inedible Plant and Animal Materials	296
12000000	Chemicals including Bio Chemicals and Gas Materials	377
13000000	Resin and Rosin and Rubber and Foam and Film and Elastomeric Materials	176
14000000	Paper Materials and Products	119
15000000	Fuels and Fuel Additives and Lubricants and Anti corrosive Materials	76
20000000	Mining and Well Drilling Machinery and Accessories	648
21000000	Farming and Fishing and Forestry and Wildlife Machinery and Accessories	78
22000000	Building and Construction Machinery and Accessories	91
23000000	Industrial Manufacturing and Processing Machinery and Accessories	621
24000000	Material Handling and Conditioning and Storage Machinery and their Accessories and Supplies	283
25000000	Commercial and Military and Private Vehicles and their Accessories and	514

[29] **Median: “ […] a** median **is described as the number separating the higher half of a sample […] from the lower half (Wikipedia: http://en.wikipedia.org/wiki/Median), i.e. 50% of all numbers are distributed below and 50% are distributed above this value.**

Segment Code	unspsc® Segment Description	Number of commodity classes
	Components	
26000000	Power Generation and Distribution Machinery and Accessories	419
27000000	Tools and General Machinery	539
30000000	Structures and Building and Construction and Manufacturing Components and Supplies	824
31000000	Manufacturing Components and Supplies	2,099
32000000	Electronic Components and Supplies	237
39000000	Electrical Systems and Lighting and Components and Accessories and Supplies	449
40000000	Distribution and Conditioning Systems and Equipment and Components	437
41000000	Laboratory and Measuring and Observing and Testing Equipment	1,329
42000000	Medical Equipment and Accessories and Supplies	2,404
43000000	Information Technology Broadcasting and Telecommunications	567
44000000	Office Equipment and Accessories and Supplies	350
45000000	Printing and Photographic and Audio and Visual Equipment and Supplies	172
46000000	Defense and Law Enforcement and Security and Safety Equipment and Supplies	277
47000000	Cleaning Equipment and Supplies	179
48000000	Service Industry Machinery and Equipment and Supplies	159
49000000	Sports and Recreational Equipment and Supplies and Accessories	239
50000000	Food Beverage and Tobacco Products	16,921
51000000	Drugs and Pharmaceutical Products	1,756
52000000	Domestic Appliances and Supplies and Consumer Electronic Products	309
53000000	Apparel and Luggage and Personal Care Products	247
54000000	Timepieces and Jewelry and Gemstone Products	49
55000000	Published Products	112
56000000	Furniture and Furnishings	215
60000000	Musical Instruments, Games, Toys, Arts, Crafts, Educational Equipment and Materials and Accessories and Supplies	1,150
70000000	Farming and Fishing and Forestry and Wildlife Contracting Services	236
71000000	Mining and oil and gas services	473
72000000	Building and Facility Construction and Maintenance Services	355
73000000	Industrial Production and Manufacturing Services	278
76000000	Industrial Cleaning Services	68
77000000	Environmental Services	81
78000000	Transportation and Storage and Mail Services	86
80000000	Management and Business Professionals and Administrative Services	193
81000000	Engineering and Research and Technology Based Services	213
82000000	Editorial and Design and Graphic and Fine Art Services	169
83000000	Public Utilities and Public Sector Related Services	95
84000000	Financial and Insurance Services	92
85000000	Healthcare Services	166
86000000	Education and Training Services	98
90000000	Travel and Food and Lodging and Entertainment Services	68
91000000	Personal and Domestic Services	36
92000000	National Defense and Public Order and Security and Safety Services	91
93000000	Politics and Civic Affairs Services	247
94000000	Organizations and Clubs	104
Total:	**55**	**38,103**

UNSPSC	No. of classes
Average	693
Max	16,921
Min	36
Median	237

Figure 24 - Evaluation of UNSPSC class numbers

The distribution of included classes is very wide in the UNSPSC, as the maximum is 16,921 (segment food, beverage, tobacco). The next highest number of classes is 2,404, the average without the food segment would be 392 – a more realistic average than 693. The median of 237 says that 50% of all segments have less than 237 classes and 50% contain more.

Table 6 - Segments of eCl@ss

Segment Code	eCl@ss Segment Description	Number of commodity classes
16000000	Food, beverage, tobacco	151
17000000	Machine, device (for special applications)	307
18000000	Equipment f. mining, metallurgical plant, rolling mill a. foundry	285
19000000	Information, communication and media technology	908
20000000	Packing material	567
21000000	Manufacturing facilities, workshop equipment, tool	1,331
22000000	Construction technology	1,379
23000000	Machine element, fixing, mounting	940
24000000	Office products, facilities and technics, papeterie	1,561
25000000	Service	1,105
26000000	Energy, extraction product, secondary raw materials and residues	218
27000000	Electric engineering, automation, process control engineering	2,573
28000000	Automotive technology	171
29000000	Home economics, Home technology	336
30000000	Auxiliary supply, additive, cleaning agent	1,068
31000000	Polymers	499
32000000	Laboratory material, Laboratory technology	1,124
33000000	Installation (complete)	364
34000000	Medicine, medical technology, life science	2,737
35000000	Semifinished products, materials	194
36000000	Machine, apparatus	1,529
37000000	Industrial piping	390
38000000	Inorganic Chemicals	1,315
39000000	Organic Chemicals	5,112
40000000	Occupational safety, accident prevention	468
41000000	Marketing	420
90000000	Interim class (unclassified)	1
Total:	**27**	**27,053**

eCl@ss	No. of classes	No. of classes without segment 90
Average	1,002	1,040
Max	5,112	5,112
Min	1	151
Median	567	738

Figure 25 - Evaluation of eCl@ss class numbers

The distribution of included classes in eCl@ss is rather equal. The average, minimum and median are also shown without the dummy segment 90 (Interim class) to deliver a more realistic picture of the distribution. That is why in this case, the average and the median are closer together, which is a sign for a more equal distribution.

Table 7 - Segments of the GPC

Segment Code	Segment Description	Number of commodity classes
10000000	Pet Care/Food	31
47000000	Homecare	42
50000000	Food/Beverage/Tobacco	303
51000000	Healthcare	135
53000000	Beauty/Personal Care/Hygiene	129
54000000	Baby Care	51
58000000	Cross Segment	2
60000000	Textual/Printed/Reference Materials	11
61000000	Music	26
62000000	Stationery/Office Machinery/Occasion Supplies	111
63000000	Footwear	14
64000000	Personal Accessories	30
65000000	Computing	81
66000000	Communications	36
67000000	Clothing	48
68000000	Audio Visual/Photography	149
70000000	Arts/Crafts/Needlework	78
71000000	Sports Equipment	121
72000000	Home Appliances	114
73000000	Household Kitchen Merchandise	78
74000000	Camping	34
75000000	Household/Office Furniture/Furnishings	81
77000000	Automotive	265
78000000	Electrical Supplies	58
79000000	Plumbing/Heating/Ventilation/Air Conditioning	75
80000000	Tools/Equipment – Hand	99
81000000	Lawn/Garden Supplies	206
82000000	Tools/Equipment - Power	77
83000000	Building Products	229
84000000	Tool Storage/Workshop Aids	13
85000000	Safety/Protection – DIY	18
86000000	Toys/Games	73
87000000	Fuels	12
88000000	Lubricants	15
89000000	Live Animals	27
91000000	Safety/Security/Surveillance	51
Total:	**36**	**2,923**

GPC	No. of classes	No. of classes without cross segment
Average	81	83
Max	303	303
Min	2	11
Median	66	73

Figure 26 - Evaluation of GPC class numbers

The distribution of included classes in the GPC is equal. The average, minimum and median are also shown without the dummy cross segment 58 to deliver a more realistic picture of the distribution. That is why in this case, the average and the median are almost equal, which is a sign for an equal distribution.

Table 8 - Segments of the CPV

Segment Code	CPV Segment description	Number of commodity classes
03000000-1	Agricultural, farming, fishing, forestry and related products	209
09000000-3	Petroleum products, fuel, electricity and other sources of energy	79
14000000-1	Mining, basic metals and related products	112
15000000-8	Food, beverages, tobacco and related products	431
16000000-5	Agricultural machinery	12
18000000-9	Clothing, footwear, luggage articles and accessories	160
19000000-6	Leather and textile fabrics, plastic and rubber materials	63
22000000-0	Printed matter and related products	75
24000000-4	Chemical products	259
30000000-9	Office and computing machinery, equipment and supplies except furniture and software packages	386
31000000-6	Electrical machinery, apparatus, equipment and consumables; Lighting	322
32000000-3	Radio, television, communication, telecommunication and related equipment	196
33000000-0	Medical equipments, pharmaceuticals and personal care products	603
34000000-7	Transport equipment and auxiliary products to transportation	423
35000000-4	Security, fire-fighting, police and defence equipment	175
37000000-8	Musical instruments, sport goods, games, toys, handicraft, art materials and accessories	324
38000000-5	Laboratory, optical and precision equipments (excl. glasses)	262
39000000-2	Furniture (incl. office furniture), furnishings, domestic appliances (excl. lighting) and cleaning p	429
41000000-9	Collected and purified water	2
42000000-6	Industrial machinery	504
43000000-3	Machinery for mining, quarrying, construction equipment	95
44000000-0	Construction structures and materials; auxiliary products to construction (excepts electric apparatus)	497
45000000-7	Construction work	796
48000000-8	Software package and information systems	141
50000000-5	Repair and maintenance services	180
51000000-9	Installation services (except software)	75
55000000-0	Hotel, restaurant and retail trade services	17
60000000-8	Transport services (excl. Waste transport)	29
63000000-9	Supporting and auxiliary transport services; travel agencies services	74
64000000-6	Postal and telecommunications services	48
65000000-3	Public utilities	4
66000000-0	Financial and insurance services	71
70000000-1	Real estate services	23
71000000-8	Architectural, construction, engineering and inspection services	154
72000000-5	IT services: consulting, software development, Internet and support	216
73000000-2	Research and development services and related consultancy services	14
75000000-6	Administration, defence and social security services	41
76000000-3	Services related to the oil and gas industry	41
77000000-0	Agricultural, forestry, horticultural, aquacultural and apicultural services	28
79000000-4	Business services: law, marketing, consulting, recruitment, printing and security	153
80000000-4	Education and training services	23
85000000-9	Health and social work services	84
90000000-7	Sewage-, refuse-, cleaning-, and environmental services	164
92000000-1	Recreational, cultural and sporting services	78
98000000-3	Other community, social and personal services	65
Total:	**45**	**8,137**

CPV	No. of classes
Average	181
Max	796
Min	2
Median	112

Figure 27 - Evaluation of CPV class numbers

The distribution of included classes in the CPV is rather wide. There are 22 segments with less than 100 classes, five of them with less than 20, the maximum being more than 40 times bigger than that. Also, two segments contain less than five classes – a fact that raises the question, if they are legitimate segments.

5.1.4.3 Coverage of segments by other standards: numerical summary

To sum up the results of the comparison (method as described in 5.1.3), the following four figures show the number of UNSPSC-, CPV-, GPC- and eCl@ss-segments covered by the other standards:

Stats	unspsc		eCl@ss	GS1 GPC
# of segments	**55**	45	27	36
# of commodity classes	38 ,103	8 ,137	27 ,053	2 ,923
UNSPSC-segments covered	--	**50**	**45**	**22**
UNSPSC-segments not covered	--	**5**	**10**	**33**

Figure 28 - Coverage of UNSPSC segments (summary: absolute number)

Stats		unspsc	eCl@ss	GS1 GPC
# of segments	**45**	55	27	36
# of commodity classes	8 ,137	38 ,103	27 ,053	2 ,923
CPV-segments covered	--	**45**	**40**	**15**
CPV-segments not covered	--	**--**	**5**	**30**

Figure 29 - Coverage of CPV segments (summary: absolute number)

Stats	GPC		unspsc	eCl@ss
# of segments	**36**	45	55	27
# of commodity classes	2,923	8,137	38,103	27,053
GPC-segments covered	--	**30**	**35**	**28**
GPC-segments not covered	--	**6**	**1**	**8**

Figure 30 - Coverage of GPC segments (summary: absolute number)

Stats	eCl@ss	GPC		unspsc
# of segments	**27**	36	45	55
# of commodity classes	27,053	2,923	8,137	38,103
eCl@ss-segments covered	--	**14**	**21**	**25**
eCl@ss-segments not covered	--	**13**	**6**	**2**

Figure 31 - Coverage of eCl@ss segments (summary: absolute number)

The figures show that the UNSPSC is in fact the broadest standard as far as covered segments are concerned. No standard covers all UNSPSC-segments. Hence, there are gaps in all other standards. The UNSPSC itself covers all of the CPV-segments and lacks only one GPC-segment (58 “Cross Segment”) and only two eCl@ss-segments (35 “Semifinished products, materials” and 90 “Interim class (unclassified)”).

Both GPC’s “Cross Segment” and eCl@ss’ “Interim class” do not contain any substantial content, but exclusively refer to any other class that is not yet integrated into these standards and shall help to exchange data anyway with the help of this dummy class. They are therefore not to be regarded as real segments that represent the requirements of any industrial branch or market. The UNSPSC does not contain a segment like this. Therefore, there is only one single segment in any other standard that is not covered by the UNSPSC, i.e. 35 “Semifinished products, materials” of eCl@ss.

5.1.4.4 Coverage of segments by other standards: detailed description

The following four figures show which segments are covered by the other standards in detail. Included are the potential numbers of matching commodity classes referring to the identified matching areas. Please note that the sum of the potential numbers will outnumber the total amount of commodity classes in the standards, as overlaps are possible. The analysis did not take place on the 4th level, therefore the identified classes could be part of different segments. The figures show that certain segments match almost 1:1, others match with more than one sub-group of another standard.

NOTE 1
part of = Is a part of the UNSPSC segment
part in = UNSPSC segment is part of other standard’s segment
grey fields = UNSPSC segments that are completely missing in the other standards
potential no. of classes = Potential coverage of matching commodity classes (in reality, fewer classes match)
Of course, no keywords, properties nor values are being regarded here.

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
10 Live Plant and Animal Material and Accessories and Supplies	236	X	x	89 Live Animals	27	03 (part in) Agricultural, farming, fishing, forestry and related products	209
11 Mineral and Textile and Inedible Plant and Animal Materials	296	(part of) 26-01 Mining industry products, Crude oil, Raw gas, mineral production products	48	x	X	(part of) 14 Mining, basic metals and related products	112
12 Chemicals including Bio Chemicals and Gas Materials	377	38 Inorganic Chemicals; 39 Organic Chemicals; 32-14 Chemical (inorganic, lab); 32-15 Chemical (organic, lab); 32-16 Chemical (lab, other)	6,845	x	X	24 Chemical products	259
13 Resin and Rosin and Rubber and Foam and Film and Elastomeric Materials	176	31 Polymers	499	x	X	19 (part in) Leather and textile fabrics, plastic and rubber materials	63
14 Paper Materials and Products	119	24 (part of) Office products, facilities and technics, papeterie	1,561	x	X	22 Printed matter and related products	75
15 Fuels and Fuel Additives and Lubricants and Anti corrosive Materials	76	26-04 (part in) Fuel oil, Fuel, Nuclear Fuel, Industrial Oils, Surrogate Fuel Biomass	67	87 Fuels; 88 Lubricants	27	09 (part in) Petroleum products, fuel, electricity and other sources of energy	79
20 Mining and Well Drilling Machinery and Accessories	648	18 Equipment f. mining, metallurgical plant, rolling mill a. Foundry	285	x	X	43 (part in) Machinery for mining, quarrying, construction equipment	95
21 Farming and Fishing and Forestry and Wildlife Machinery and Accessories	78	X	x	x	X	16 Agricultural machinery	12

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
22 Building and Construction Machinery and Accessories	91	17-05 Machine f. construction a. building materials industry; 22 Construction technology	1,385	83 Building Products	229	43 (part in) Machinery for mining, quarrying, construction equipment	95
23 Industrial Manufacturing and Processing Machinery and Accessories	621	17 Machine, device (for special applications); 21 Manufacturing facilities, workshop equipment, tool; 27 process control engineering, 36 Machine, apparatus	5,433	x	X	42 Industrial machinery	504
24 Material Handling and Conditioning and Storage Machinery and their Accessories and Supplies	283	36-03 Container; 36-12 Materials-handling a. storage technology; 28-02 Hoisting, lifting vehicle; 20 Packing material	718	x	X	x	x
25 Commercial and Military and Private Vehicles and their Accessories and Components	514	28 Automotive technology	171	77 Automotive	265	34 Transport equipment and auxiliary products to transportation	423
26 Power Generation and Distribution Machinery and Accessories	419	27-02 Electrical drive; 27-04 Power Supply; 27-37 Low-voltage switch technology; 36 Machine apparatus (reactors, engines); 27-06 Cable, wire; 33-04 Energy generation plant (complete)	1,848	x	X	x	x
27 Tools and General Machinery	539	21 Tool	1,331	80 Tools/Equipment - Hand; 81 Lawn/Garden Supplies; 82 Tools/Equipment - Power	382	x	x

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
30 Structures and Building and Construction and Manufacturing Components and Supplies	824	22 (part of) Construction technology	1,379	83 Building Products	229	44 Construction structures and materials; auxiliary products to construction (excepts electric apparatus)	497
31 Manufacturing Components and Supplies	2,099	33-14 Metallurgical plant, rolling mill, forge a. foundry (complete); 18 Equipment f. mining, metallurgical plant, rolling mill a. foundry; 21-13 Standardized tool parts; 27-06 Cable, wire; 23 Machine element, fixing, mounting	1,646	x	X	44-5 Tools, locks, keys, hinges, fasteners, chain and springs; 39-5-4 Miscellaneous cordage, rope, twine and netting	86
32 Electronic Components and Supplies	237	19 (part of) Information, communication and media technology; 27 (part of) Electric engineering, automation, process control engineering	3,481	x	X	x	x
39 Electrical systems and Lighting and components and accessories and supplies	449	27 (part of) Electric engineering, automation, process control engineering; 21 (part of) Manufacturing facilities, workshop equipment, tool	3,904	78 Electrical supplies	58	31 Electrical machinery, apparatus, equipment and consumables; Lighting	322
40 Distribution and Conditioning Systems and Equipment and Components	437	22-41 Air treatment, ventilation system; 27 Electric engineering, automation, process control	3,327	79 Plumbing/Heating/Ventilation/Air Conditioning	75	(part in) 42 Industrial machinery	552

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
		engineering; 37 Industrial piping; 21-13 Standardized tool parts; 22-14 Pipe and pipe fitting; 33-07 Infrastructure installation, distribution, supply (complete)					
41 Laboratory and Measuring and Observing and Testing Equipment	1,329	32 Laboratory material, Laboratory technology (1124)	1,124	x	X	38 Laboratory, optical and precision equipments (excl. glasses)	262
42 Medical Equipment and Accessories and Supplies	2,404	34 (part of) Medicine, medical technology, life science	2,737	51 Healthcare	135	33 (part in) Medical equipments, pharmaceuticals and personal care products	603
43 Information Technology Broadcasting and Telecommunications	567	19 (part of) Information, communication and media technology	908	x	X	32 Radio, television, communication, telecommunication and related equipment	196
44 Office Equipment and Accessories and Supplies	350	24 (part of) Office products, facilities and technics, papeterie	1,561	62 (part in) Stationery/Office Machinery/Occasion Supplies	13	30 Office and computing machinery, equipment and supplies except furniture and software packages	386
45 Printing and Photographic and Audio and Visual Equipment and Supplies	172	19-10 Photo technology, video technology; 19-11 Microfilming; 24-26-17 Office film; 24-26-18 Drawing film, graphic film	48	68 Audio Visual/Photography	149	(Part in) 30-1 Office machinery, equipment and supplies except computers, printers and furniture	266
46 Defense and Law Enforcement and	277	40 Occupational safety, accident prevention	468	85 Safety/Protection - DIY; 91	69	35 Security, fire-fighting, police and	175

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
Security and Safety Equipment and Supplies				Safety/Security/Surveillance		defence equipment	
47 Cleaning Equipment and Supplies	179	21-04-11-00 Brushing tool; 21-19 Cleaning device (plant equipment, workshop equipment); 29-11 Cleaning agent (manual); 29-16 Laundry devices; 30-01-02 Water treatment agent; 30-02 Cleaning, maintenance agent; 30-30 Disinfection and cleansing supplies; 32-05 Cleansing and disinfection device (lab)	282	47 (part in) Homecare	42	39-8 Cleaning and polishing products (22)	22
48 Service Industry Machinery and Equipment and Supplies	159	parts in: 29 Home economics	336	x	X	39-1 Furniture; 39-2-2 Kitchen equipment, household and domestic items and catering supplies	163
49 Sports and Recreational Equipment and Supplies and Accessories	239	X	x	71 Sports Equipment; 74 Camping; 81 (part in) Lawn/Garden Supplies	361	37 (part in) Musical instruments, sport goods, games, toys, handicraft, art materials and accessories	324
50 Food Beverage and Tobacco Products	16,921	16 Food, beverage, tobacco	151	50 Food/Beverage/Tobacco	303	15 Food, beverages, tobacco and related products	431
51 Drugs and Pharmaceutical Products	1,756	34 (part of) Medicine, medical technology, life science	2,737	51 (part in) Healthcare; 53 (part in) Beauty/Personal Care/Hygiene	264	33 (part in) Medical equipments, pharmaceuticals and personal care products	603

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
52 Domestic Appliances and Supplies and Consumer Electronic Products	309	29 Home economics, home technology; 19 (part of) Information, communication and media technology	1,244	72 Home Appliances; 73 Household Kitchen Merchandise	192	(part in) 39-2-2 Kitchen equipment, household and domestic items and catering supplies	62
53 Apparel and Luggage and Personal Care Products	247	40-01 work clothing; 24-36 bag, case incl. Suitcases	264	53 (part of) Beauty/Personal Care/Hygiene; 64 (part of) Personal Accessories	159	18 (part in) Clothing, footwear, luggage articles and accessories	160
54 Timepieces and Jewelry and Gemstone Products	49	(part in) 41-01 Promotional article	88	64 (part of) Personal Accessories	30	18-05 Jewellery, watches and related articles	24
55 Published Products	112	24-35 literature incl. public press; Banner: 41-01; 20-35 Label (product, shipping, packing material); 40-20 Sign, mandatory sign, traffic sign; more signs and labels in different segments	220	60 Textual/Printed/Reference Materials	11	22 Printed matter and related products; 34-9-9 Control, safety, signalling and light equipment [signs]; 35-8-2 Support equipment [flags, security]	139
56 Furniture and Furnishings	215	24-31 Office furnishing (104), 32-02 Furnishing, installation (lab) (23), 34-45 Hospital furniture (111)	238	75 (part of) Household/Office Furniture/Furnishings	81	39 Furniture (incl. office furniture), furnishings, domestic appliances (excl. lighting) and cleaning products	429
60 Musical Instruments and Games and Toys and Arts and Crafts and Educational Equipment and Materials and Accessories and Supplies	1,150	X	x	61 Music; 86 Toys/Games; 70 Arts/Crafts/Needlework	177	37 (part in) Musical instruments, sport goods, games, toys, handicraft, art materials and accessories	324

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
70 Farming and Fishing and Forestry and Wildlife Contracting Services	236	X	Xx	x	X	77 Agricultural, forestry, horticultural, aquacultural and apicultural services	28
71 Mining and Oil and Gas Services	473	X	Xx	x	X	76 Services related to the oil and gas industry	41
72 Building and Construction and Maintenance Services	355	22-10 Construction service - single activity (338), 22-11 Special construction work (22), 22-12 Construction service skill category (19)	379	x	X	45 Construction work; 71 Architectural, construction, engineering and inspection services	950
73 Industrial Production and Manufacturing Services	278	x	Xx	x	X	(part in) 50 Repair and maintenance services; (part in) 51 Installation services (except software); (part in) 71 Architectural, construction, engineering and inspection services; 76 Services related to the oil and gas industry	585
76 Industrial Cleaning Services	68	25-04 Facility Management; 25-04-10 Sanitation Service; 25-05 Recycling and waste management	139	x	X	(part in) 90 Sewage, refuse, cleaning and environmental services	197
77 Environmental Services	81	25-02 Environmental protection planning (building planning); 25-05	282	x	x	90 Sewage-, refuse-, cleaning-, and environmental services	164

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
		Recycling and waste management; 25-14 Analysis, laboratory and inspection service; 25-25-11 Environment training; 25-26-08 Environmental management					
78 Transportation and Storage and Mail Services	86	25-07 Logistics Service; 25-04-13 Storage Service (facility); 25-07-05 Letter, package transport	62	x	X	60 Transport services (excl. Waste transport); 64 Postal and telecommunications services; 63 Supporting and auxiliary transport services; travel agencies services	151
80 Management and Business Professionals and Administrative Services	193	25-10 Legal (service); 25-11 Personnel management; 25-25 Training, further training; 25-26 Consulting, mediation	368	x	X	79 Business services: law, marketing, consulting, recruitment, printing and security	153
81 Engineering and Research and Technology Based Services	213	25-02 Development, planning, engineering service; 25-15 Finance and insurance service; 25-24 Information, communication service	179	x	X	73 Research and development services and related consultancy services	14
82 Editorial and Design and Graphic and Fine Art Services	169	41-14 Service (marketing); 25-16 Service (unclassified); 26-16-15 Translation, language service	127	x	x	(part in) 79 Business services: law, marketing, consulting, recruitment, printing and security; (part in) 92	304

UNSPSC v11 EN	No of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes
						Recreational, cultural and sporting services	
83 Public Utilities and Public Sector Related Services	95	X	x	x	X	65 Public utilities	4
84 Financial and Insurance Services	92	25-15 Finance and insurance service	92	x	X	66 Financial and insurance services	71
85 Healthcare Services	166	25-18-01 Medical Service (Personal Service)	5	x	X	85 Health and social work services	84
86 Education and Training Services	98	(part in 25-25) Training, further training	214	x	X	80 Education and training services	23
90 Travel and Food and Lodging and Entertainment Services	68	(part in) 25-12 Travel management; 25-20 Food and service	40	x	X	55 (part in) Hotel, restaurant and retail trade services	17
91 Personal and Domestic Services	36	25-18 Personal service	13	x	X	98 (part in) Other community, social and personal services	65
92 National Defense and Public Order and Security and Safety Services	91	25-01 Security service	25	x	X	75 (part in) Administration, defence and social security services	41
93 Politics and Civic Affairs Services	247	X	x	x	X	75 (part in) Administration, defence and social security services	41
94 Organizations and Clubs	104	X	x	x	X	x	x
Total no. of potential classes	38,103		48,973		3,399		11,314

Figure 32 - Coverage of UNSPSC segments

NOTE 2
part of = Is a part of the CPV segment
part in = CPV segment is part of other standard's segment
grey fields = CPV segments that are completely missing in the other standards
potential no. of classes = Potential coverage of matching commodity classes (in reality, fewer classes match)
Of course, no keywords, properties nor values are being regarded here

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
03 Agricultural, farming, fishing, forestry and related products	209	10 Live Plant and Animal Material and Accessories and Supplies (236), 50 Food Beverage and Tobacco Products (16,921)	17,157	(part of) 16 Food, beverage, tobacco (151)	151	(part of) 50 Food/Beverage /Tobacco (303)	303
09 Petroleum products, fuel, electricity and other sources of energy	79	15 Fuels and Fuel Additives and Lubricants and Anti corrosive Materials	76	26 Energy, extraction product, secondary raw materials and residues (218)	218	87 Fuels (12), 88 Lubricants (15)	27
14 Mining, basic metals and related products	112	11 Mineral and Textile and Inedible Plant and Animal Materials	296	26-01 Mining industry products, Crude oil, Raw gas, mineral production products	48	x	X
15 Food, beverages, tobacco and related products	431	50 Food Beverage and Tobacco Products	16,921	16 Food, beverage, tobacco (151)	151	50 Food/Beverage /Tobacco (303)	303
16 Agricultural machinery	12	(part in) 21 Farming and Fishing and Forestry and Wildlife Machinery and Accessories	78	x	x	x	X
18 Clothing, footwear, luggage articles and accessories	160	53 Apparel and Luggage and Personal Care Products (247), 54 Timepieces and Jewelry and Gemstone Products (49)	296	40-01 work clothing (237), 24-36 bag, case incl. suitcases (27), 41-01 Promotional article (88)	352	53 (part of) Beauty/Personal Care/Hygiene (129), 64 (part of) Personal Accessories (30)	159
19 Leather and textile fabrics, plastic and rubber materials	63	(part of) 13 Resin and Rosin and Rubber and Foam and Film and Elastomeric Materials	176	(part of) 31 Polymers (499)	499	x	X

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
22 Printed matter and related products	75	14 Paper Materials and Products (119), 55 Published Products (112)	231	24 (part of) Office products, facilities and technics, papeterie (1561), 24-35 literature incl. public press (102), Banner: 41-01 (88), 20-35 Label (product, shipping, packing material) (23)	1,774	60 Textual/Printed /Reference Materials (11)	11
24 Chemical products	259	12 Chemicals including Bio Chemicals and Gas Materials	377	38 Inorganic Chemicals (1315) and 39 Organic Chemicals (5112), 32-14 Chemical (inorganic, lab) (129), 32-15 Chemical (organic, lab) (254), 32-16 Chemical (lab, other) (35)	6,845	x	X
30 Office and computing machinery, equipment and supplies except furniture and software packages	386	44 Office Equipment and Accessories and Supplies (350), 32 Electronic Components and Supplies (237)	587	24 Office products, facilities and technics, papeterie (1561), 19 (part of) Information, communicatio n and media technology (908)	2,469	62 (part in) Stationery/Offi ce Machinery/Occ asion Supplies (13), 65 Computing (85), 66 Communicatio ns (36)	134
31 Electrical machinery, apparatus, equipment and consumables; Lighting	322	39 Electrical systems and Lighting and components and accessories and supplies	449	27 (part of) Electric engineering, automation, process control engineering (2573), 21 (part of) Manufacturing facilities, workshop equipment, tool (1331)	3,904	78 Electrical supplies (58)	58

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
32 Radio, television, communication, telecommunication and related equipment	196	43 Information Technology Broadcasting and Telecommunications	567	19 (part of) Information, communication and media technology (908)	908	x	X
33 Medical equipments, pharmaceuticals and personal care products	603	42 Medical Equipment and Accessories and Supplies	2,404	34 (part of) Medicine, medical technology, life science (2737)	2,737	51 Healthcare (135)	135
34 Transport equipment and auxiliary products to transportation	423	(part in) 25 Commercial and Military and Private Vehicles and their Accessories and Components	514	28 Automotive technology (171)	171	77 Automotive (265)	265
35 Security, fire-fighting, police and defence equipment	175	46 Defense and Law Enforcement and Security and Safety Equipment and Supplies	277	40 Occupational safety, accident prevention (468)	468	85 Safety/Protection - DIY (18), 91 Safety/Security /Surveillance (51)	69
37 Musical instruments, sport goods, games, toys, handicraft, art materials and accessories	324	60 Musical Instruments and Games and Toys and Arts and Crafts and Educational Equipment and Materials and Accessories and Supplies (1150), 49 Sports and Recreational Equipment and Supplies and Accessories (239)	1,389	x	x	61 Music (26), 86 Toys/Games (73), 70 Arts/Crafts/Needlework (78), 71 Sports Equipment (121), 74 Camping (34), 81 (part in) Lawn/Garden Supplies (206)	538
38 Laboratory, optical and precision equipments (excl. glasses)	262	41 Laboratory and Measuring and Observing and Testing Equipment	1,329	32 Laboratory material, Laboratory technology (1124)	1,124	x	X

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
39 Furniture (incl. office furniture), furnishings, domestic appliances (excl. lighting) and cleaning products	429	56 Furniture and Furnishings (215), 47 Cleaning Equipment and Supplies (179), 48 Service Industry Machinery and Equipment and Supplies (159)	553	parts in: 24-31Office furnishing (104), 21-04-11-00 Brushing tool (5), 21-19 Cleaning device (plant equipment, workshop equipment) (29), 29-11 Cleaning agent (manual) (34), 29-15 (46), 29-16 Laundry devices (88), 30-01-02 Water treatment agent (5), 30-02 Cleaning, maintenance agent (58), 30-30 Disinfection and cleansing supplies (32), 32-05 Cleansing and disinfection device (lab) (31), 32-02 Furnishing, installation (lab) (23), 34-45 Hospital furniture (111)	520	75 (part of) Household/Office Furniture/Furnishings (81), 47 (part in) Homecare (42)	123
41 Collected and purified water	1	41104213 Distilled or deionized water, 50202301 Water	2	26-04-09 Water (17)	17	10000232 Packaged water	1
42 Industrial machinery	504	23 Industrial Manufacturing and Processing Machinery and Accessories	621	17 Machine, device (for special applications) [boring] 21 Manufacturing facilities, workshop	5,433	x	X

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
				equipment, tool (1331) 27 process control engineering (2573), 36 Machine, apparatus (1529)			
43 Machinery for mining, quarrying, construction equipment	95	20 Mining and Well Drilling Machinery and Accessories	648	18 Equipment f. mining, metallurgical plant, rolling mill a. foundry (285)	285	x	X
44 Construction structures and materials; auxiliary products to construction (excepts electric apparatus)	497	30 Structures and Building and Construction and Manufacturing Components and Supplies	824	22 (part of) Construction technology (1379)	1,379	83 Building Products (229)	229
45 Construction work	796	72 Building and Construction and Maintenance Services	355	22-10 Construction service - single activity (338), 22-11 Special construction work (22), 22-12 Construction service skill category (19)	379	x	X
48 Software package and information systems	141	43-23 Software (148)	148	19-21 Software (client operating system) (120), 19-22 Software (server operating system) (109), 19-23 Software (mainframe-, middleware operating system) (123), 19-24 Software (network operating system) (13)	365	650104 Computer/Video Game Software	4

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
50 Repair and maintenance services	180	repair+service or maintenance+service (75)	75	all of the following classes in all segments: xx-xx-98-xx "XYZ (maintenance, service)" (306), xx-xx-xx-98 "XYZ (maintenance, service)" (5), xx-xx-99-xx "XYZ (repair)" (235),xx-xx-xx-99 "XYZ (repair)" (4)	550	x	X
51 Installation services (except software)	75	installation+service, start up, assembly+service (90)	90	all of the following classes in all segments: xx-xx-96-xx "XYZ (start-up)" (10), xx-xx-xx-96 "XYZ (start-up)" (5), xx-xx-97-xx "XYZ (assembly)" (128)	143	x	X
55 Hotel, restaurant and retail trade services	17	90-10 Restaurants and catering (11), 90-11 Hotels and lodging and meeting facilities (14)	25	25-20 Food and service (service) (15)	15	x	X
60 Transport services (excl. Waste transport)	29	(part of) 78 Transportation and Storage and Mail Services (86), 90-12 Travel facilitation (9)	86	25-07 Logistics Service (57), 25-04-13 Storage Service (facility) (2)	62	x	X
63 Supporting and auxiliary transport services; travel agencies services	74	(part of) 78 Transportation and Storage and Mail Services (86), 90-12 Travel facilitation (9)	95	25-12 Travel management (25), (part of) 25-07 Logistics Service (57), (part of) 25-04-13 Storage Service (facility) (2)	84	x	

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
64 Postal and telecommunications services	48	(part of) 78 Transportation and Storage and Mail Services (86), 81-16-17 Telecommunication Services (11)	97	25-07-05 Letter, package transport (3), 25-24 Information, communication service (32), (part of) 25-07 Logistics service (56)	91	x	
65 Public utilities	4	83 Public Utilities and Public Sector Related Services	95	x	x	x	X
66 Financial and insurance services	71	84 Financial and Insurance Services	92	25-15 Finance and insurance service (92)	92	x	X
70 Real estate services	23	80-13 Real estate services (14)	14	(part of) 25-27 Rent, lease (10)	10	x	X
71 Architectural, construction, engineering and inspection services	154	72 Building and Construction and Maintenance Services	355	22-10 Construction service - single activity (338), 22-11 Special construction work (22), 22-12 Construction service skill category (19), 25-02 Development, planning, engineering service (55), (part of) 25-14 Analysis, laboratory and inspection service (106)	540	x	X
72 IT services: consulting, software development, Internet and support	216	(part of) 81-11 Computer services (93)	93	25-26-12 Information and communication technologies (consulting) (11), 25-25-03 Information technology (training, further	23	x	X

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
				training) (12)			
73 Research and development services and related consultancy services	14	81 Engineering and Research and Technology Based Services	213	25-02 Development, planning, engineering service (55), 25-15 Finance and insurance service (92), 25-24 Information, communicatio n service (32)	179	x	X
75 Administration, defence and social security services	41	92 National Defense and Public Order and Security and Safety Services (91), 93 Politics and Civic Affairs Services (247)	338	25.01 Security service (25), 25-25-14 politics (training)	25	x	X
76 Services related to the oil and gas industry	41	71 Mining and Oil and Gas Services	473	x	x	x	X
77 Agricultural, forestry, horticultural, aquacultural and apicultural services	28	70 Farming and Fishing and Forestry and Wildlife Contracting Services	236	x	x	x	X
79 Business services: law, marketing, consulting, recruitment, printing and security	153	80 Management and Business Professionals and Administrative Services	193	25-10 Legal (service) (34), 25-11 Personnel management (30), 25-25 Training, further training (214), 25-26 Consulting, mediation (90); Real estate: leasing, closure, rent, financing, law services	368	x	X
80 Education and training services	23	86 Education and Training	98	(part in 25.25) Training,	214	x	X

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
		Services		further training (214)			
85 Health and social work services	84	85 Healthcare Services	166	25-18-01 Medical Service (Personal Service), Health: insurance, health service training	5	x	X
90 Sewage-, refuse-, cleaning-, and environmental services	164	77 Environmental Services	81	25-02 Environmental protection planning (building planning) (55), 25-05 Recycling and waste management (94), 25-10-09-08 Environmental Law (Service) (1), 25-14 Analysis, laboratory and inspection service (106), 25-25-11 Environment training (9), 25-26-08 Environmental management (17)	282	x	X
92 Recreational, cultural and sporting services	78	82 Editorial and Design and Graphic and Fine Art Services (196), 93-14-17 Culture (14), (part of) 94 Organizations and Clubs (104)	314	(part of) 25-16 Service (unclassified) (42), (part of) 25-18 Personal service (13)	55	x	X
98 Other community, social and personal services	65	91 Personal and Domestic Services (36), (part of) 93 Politics and Civic Affairs Services (247), (part of) 92 National Defense and	374	(part of) 25-16 Service (unclassified) (42), (part of) 25-18 Personal service (13)	55	x	X

CPV 2008	Number of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes	GPC 30062008	potential no. of classes
		Public Order and Security and Safety Services (91)					
Total no. of potential classes	8,136		49,878		32,856		2,359

Figure 33 - Coverage of CPV segments

NOTE 3
part of = Is a part of the GPC segment
part in = GPC segment is part of other standard's segment
grey fields = GPC segments that are completely missing in the other standards
potential no. of classes = Potential coverage of matching commodity classes (in reality, fewer classes match)
Of course, no keywords, properties nor values are being regarded here

GPC 30062008	Number of bricks	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes
10 Pet Care/Food	31	x	x	1010 Domestic pet products (7), 1011 Animal Feed (27), 1013 Animal containment and habitats (9)	43	x	X
47 Homecare	42	39-8 Cleaning and polishing products (22)	22	4710 Water and wastewater treatment supply and disposal (55), 4713 Cleaning and janitorial supplies (76)	131	29-11 Cleaning agent (manual) (34), 29-15 (46), 29-16 Laundry devices (88), 30-01-02 Water treatment agent (5), 30-02 Cleaning, maintenance agent (58), 30-30 Disinfection and cleansing supplies (32), 32-05 Cleansing and disinfection device (lab) (31)	248

GPC 30062008	Number of bricks	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes
50 Food/Beverage/Tobacco	303	15 Food, beverages, tobacco and related products (431)	431	50 Food Beverage and Tobacco Products	16,921	16 Food, beverage, tobacco (151)	151
51 Healthcare	135	33 (part of) Medical equipments, pharmaceuticals and personal care products (603) (except 33-7 personal care products)	545	4231 Wound care products (99), 51 Drugs and Pharmaceutical Products (1756),	1,855	34 (part of) Medicine, medical technology, life science (2737)	2,737
53 Beauty/Personal Care/Hygiene	129	33-7 Personal care products (58)	58	5313 Personal care products (49)	49	x	X
54 Baby Care	51	33-7-5 Baby care products (2), 2 other baby-related classes	4	all are found in diverse segments like medicine, clothing etc., not specifically for babies	51	all are found in diverse segments like medicine, clothing etc., not specifically for babies	51
58 Cross Segment	2	x	x	x	x	90-90-90-90 Interim class (unclassified)	1
60 Textual/Printed/Reference Materials	11	22 Printed matter and related products (75)	75	5510 Printed media (26), 5511 Electronic reference material (15)	41	24-35 literature incl. public press (102)	102
61 Music	26	37-3 Musical instruments and parts (59)	59	6013 Musical Instruments and parts and accessories (141)	141	x	X
62 Stationery/Office Machinery/Occasion Supplies	111	30-1 Office machinery, equipment and supplies except computers, printers and furniture (218)	218	44 Office Equipment and Accessories and Supplies	350	24 (part of) Office products, facilities and technics, papeterie (1561)	1,561
63 Footwear	14	18-8 Footwear (13)	13	5311 Footwear (35)	35	40-01-13 Foot protection	13
64 Personal Accessories	30	18-5 Jewellery, watches and related articles (14), 18-9 Luggage, saddlery, sacks and bags (7)	21	5312 Luggage and handbags and packs and cases (19), 54 Timepieces and Jewellery	68	24-36 bag, case incl. suitcases (27)	27

GPC 30062008	Number of bricks	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes
				and Gemstone Products (49)			
65 Computing	81	30-2 Computer equipment and supplies (116)	116	4312 Computer Equipment and Accessories (96), 4320 Components for information technology or broadcasting or telecommunications (127)	223	19 (part of) Information, communication and media technology (except of software)	503
66 Communications	36	(part of) 32 Radio, television, communication, telecommunication and related equipment (122)	122	4319 Communications Devices and Accessories (43)	43	19 (part of) Information, communication and media technology (except of software)	503
67 Clothing	48	(part of) 18 Clothing, footwear, luggage articles and accessories (except of 18-8 Footwear (13) and 18-5 Jewellery, watches and related articles (14) and 18-9 Luggage, saddlery, sacks and bags (7))	126	5310 Clothing (106)	106	40-01 Work clothing, protective clothing (237)	237
68 Audio Visual/Photography	149	(part in) 32 Radio, television, communication, telecommunication and related equipment (122)	122	45 Printing and Photographic and Audio and Visual Equipment and Supplies	172	19-10 Photo technology, video technology (27), 19-11 Microfilming (4), 24-26-17 Office film (12), 24-26-18 Drawing film, graphic film (5)	48

GPC 30062008	Number of bricks	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes
70 Arts/Crafts/Needle work	78	37-8 Handicraft and art supplies (13)	13	6012 Arts and crafts equipment and accessories and supplies (353)	353	x	X
71 Sports Equipment	121	37-4 Sports goods and equipment (165)	165	49 Sports and Recreational Equipment and Supplies and Accessories	239	x	X
72 Home Appliances	114	39-7 Domestic appliances (65)	65	(part of) 52 Domestic Appliances and Supplies and Consumer Electronic Products	309	(part of) 29 Home economics, home technology (336)	336
73 Household Kitchen Merchandise	78	39-2-2 Kitchen equipment, household and domestic items and catering supplies (62)	62	5215 Domestic kitchenware and kitchen supplies (123)	123	(part of) 29 Home economics, home technology (336)	336
74 Camping	34	37-4-1-4 Camping goods (6)	6	4912 Camping and outdoor equipment and accessories (12)	12	x	X
75 Household/Office Furniture/Furnishings	81	(part of) 39 Furniture (incl. office furniture), furnishings, domestic appliances (excl. lighting) and cleaning products (429)	429	56 Furniture and Furnishings	215	24-31 Office furnishing (104), 32-02 Furnishing, installation (lab) (23), 34-45 Hospital furniture (111)	238
77 Automotive	265	(part of) 34 Transport equipment and auxiliary products to transportation (423)	423	25 Commercial and Military and Private Vehicles and their Accessories and Components	514	28 Automotive technology (171)	171

GPC 30062008	Number of bricks	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes
78 Electrical Supplies	58	(part of) 31 Electrical machinery, apparatus, equipment and consumables; Lighting (322)	322	32 Electronic Components and Supplies (23), 39 Electrical systems and Lighting and components and accessories and supplies (449)	686	27 (part of) Electric engineering, automation, process control engineering (2573)	2,573
79 Plumbing/Heating/ Ventilation/Air Conditioning	75	42-5 Cooling and ventilation equipment (20)	20	(part of) 40 Distribution and Conditioning Systems and Equipment and Components	437	22-41 Air treatment, ventilation system (102), 37 Industrial piping (valves) (390), 21-13 Standardized tool parts (tool, die and mold making) (221), 22-14 Pipe and pipe fitting (10), 33-07 Infrastructure installation, distribution, supply (complete) (31)	754
80 Tools/Equipment –- Hand	99	x	x	2711 Hand tools (466)	466	21-04 Hand tool (330)	330
81 Lawn/Garden Supplies	206	x	x	271120 Agriculture, forestry and garden hand tools (39)	39	21-04-10 Digging tool, garden tool (6), 21 (10 hose-related classes)	16
82 Tools/Equipment –- Power	77	x	x	2712 Hydraulic machinery and equipment, 2713 Pneumatic machinery and equipment, 2714 Automotive specialty tools	73	(part of) 21 Manufacturing facilities, workshop equipment, tool (except Hand tool)	1,001

GPC 30062008	Number of bricks	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes
83 Building Products	229	(part of) 44 Construction structures and materials; auxiliary products to construction (excepts electric apparatus) (497)	497	22 Building and Construction Machinery and Accessories (91), 30 Structures and Building and Construction and Manufacturing Components and Supplies (824)	915	17-05 Machine f. construction a. building materials industry (6), (part in) 22 Construction technology (1379)	1,385
84 Tool Storage/Workshop Aids	13	x	x	241124 Storage chests and cabinets and trunks (11), 3126 Housings and cabinets and casings (12)	23	21-07 Transport device (workshop) (20), 21-10-01 Tool box, tool bag (workshop) (2), 21-10-04 Storage equip. (workshop) (29)	51
85 Safety/Protection – - DIY	18	(part of) 35 Security, fire-fighting, police and defence equipment (175)	175	4618 Personal safety and protection (122)	122	(part of) 40 Occupational safety, accident prevention (468)	468
86 Toys/Games	73	37-5 Games and toys; fairground amusements (33)	33	6014 Toys and games (57)	57	x	X
87 Fuels	12	09 (part of) Petroleum products, fuel, electricity and other sources of energy (79)	79	1510 Fuels (21), 1511 Gaseous fuels and additives (13), 1513 Fuel for nuclear reactors (6)	40	26-04 (part of) Fuel oil, Fuel, Nuclear Fuel, Industrial Oils, Surrogate Fuel Biomass (67)	67
88 Lubricants	15	09 (part of) Petroleum products, fuel, electricity and other sources of energy (79)	79	1512 Lubricants and oils and greases and anti corrosives (36)	36	26-04 (part of) Fuel oil, Fuel, Nuclear Fuel, Industrial Oils, Surrogate Fuel Biomass (67)	67

GPC 30062008	Number of bricks	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes	eCl@ss 6.0.1 EN	potential no. of classes
89 Live Animals	27	03-3-1 Fish, crustaceans and aquatic products (20), 03-3-2 Cattle, livestock and small animals (7)	27	1010 Live animals (41)	41	x	X
91 Safety/Security/Surveillance	51	(part of) 35 Security, fire-fighting, police and defence equipment (175)	175	4616 Public safety and control (17), 4617 Security surveillance and detection (43), 4619 Fire protection (19)	79	(part of) 40 Occupational safety, accident prevention (468)	468
Total no. of potential classes	2,923		4,502		25,008		14,443

Figure 34 - Coverage of GPC segments

NOTE 4
part of = Is a part of the eCl@ss segment
part in = eCl@ss segment is part of other standard's segment
grey fields = eCl@ss segments that are completely missing in the other standards
potential no. of classes = Potential coverage of matching commodity classes (in reality, fewer classes match)
Of course, no keywords, properties nor values are being regarded here

eCl@ss 6.0.1 EN	Number of bricks	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes
16 Food, beverage, tobacco	151	50 Food/Beverage/ Tobacco	303	15 Food, beverages, tobacco and related products (431)	431	50 Food Beverage and Tobacco Products	16,921
17 Machine, device (for special applications)	307	x	x	(part of) 42 Industrial machinery (504)	504	(part of) 23 Industrial Manufacturing and Processing Machinery and Accessories (621)	621

eCl@ss 6.0.1 EN	Number of bricks	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes
18 Equipment f. mining, metallurgical plant, rolling mill a. foundry	285	x	x	43 (part in) Machinery for mining, quarrying, construction equipment (95)	95	20 Mining and Well Drilling Machinery and Accessories	648
19 Information, communication and media technology	908	(part in) 65 Computing (81), 66 Communications (36), 68 Audio Visual/Photography (149)	266	30-2 Computer equipment and supplies (116), 32 Radio, television, communication, telecommunication and related equipment (196)	312	(part of) 43 Information Technology Broadcasting and Telecommunications (567), 45 Printing and Photographic and Audio and Visual Equipment and Supplies (172)	739
20 Packing material	567	x	x	x	x	(part of) 24-12 Packaging materials (22), 24-14 Packing supplies (32)	54
21 Manufacturing facilities, workshop equipment, tool	1,331	80 Tools/Equipment - Hand (99), 82 Tools/Equipment - Power (77), 84 Tool Storage/Workshop Aids (13)	189	x	x	2712 Hydraulic machinery and equipment, 2713 Pneumatic machinery and equipment, 2714 Automotive specialty tools	73
22 Construction technology	1,379	(part in) 79 Plumbing/Heating/Ventilation/Air Conditioning (75), 83 Building Products (229)	304	43 Machinery for mining, quarrying, construction equipment (95), 44 Construction structures and materials; auxiliary products to construction (excepts electric apparatus) (497)	592	(part of) 22 Building and Construction Machinery and Accessories (91), 30 Structures and Building and Construction and Manufacturing Components and Supplies (824), 72 Building and Construction and Maintenance Services (355)	1,270

eCl@ss 6.0.1 EN	Number of bricks	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes
23 Machine element, fixing, mounting	940	x	x	44-5-3 Fasteners (15)	15	31-16 Hardware (332) and other 31-xx parts	332+
24 Office products, facilities and technics, papeterie	1,561	60 Textual/Printed/ Reference Materials (11), 62 Stationery/Office Machinery/Occasion Supplies (111), 64 Personal Accessories (30), (part of) 75 Household/Office Furniture/Furnishings (81)	233	(part of) 30-1 Office machinery, equipment and supplies except computers, printers and furniture (218)	218	14 Paper Materials and Products (119), 44 Office Equipment and Accessories and Supplies (350), (part of) 53 Apparel and Luggage and Personal Care Products (247)	716
25 Service	1,105	x	x	Segments 50-98	1,582	Segments 70-94	3,045
26 Energy, extraction product, secondary raw materials and residues	218	(part in) 87 Fuels (12), 88 Lubricants (15)	27	09 Petroleum products, fuel, electricity and other sources of energy (79), 14 Mining, basic metals and related products (112)	191	(part of) 11 Mineral and Textile and Inedible Plant and Animal Materials (296), 15 Fuels and Fuel Additives and Lubricants and Anti corrosive Materials (76)	372
27 Electric engineering, automation, process control engineering	2,573	(part in) 78 Electrical Supplies (59)	58	(part of) 31 Electrical machinery, apparatus, equipment and consumables; Lighting (322)	322	(part of) 23 Industrial Manufacturing and Processing Machinery and Accessories (621), 26-12 Electrical wire and cable and harness (83), 32 Electronic Components and Supplies (237), 39 Electrical systems and Lighting and components and	1,390

eCl@ss 6.0.1 EN	Number of bricks	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes
						accessories and supplies (449)	
28 Automotive technology	171	77 Automotive (265)	265	(part of) 34 Transport equipment and auxiliary products to transportation (423), (part of) 42 Industrial machinery (504)	927	(part in) 25 Commercial and Military and Private Vehicles and their Accessories and Components	514
29 Home economics, Home technology	336	72 Home Appliances (114), 73 Household Kitchen Merchandise (78)	192	39-7 Domestic appliances (65), 39-2-2 Kitchen equipment, household and domestic items and catering supplies (62)	127	52 Domestic Appliances and Supplies and Consumer Electronic Products	309
30 Auxiliary supply, additive, cleaning agent	1,068	(part in) 47 Homecare (42)	42	39-8 Cleaning and polishing products (22)	22	47 Cleaning Equipment and Supplies (179)	179
31 Polymers	499	x	x	(part in) 19 Leather and textile fabrics, plastic and rubber materials (63), 24-5 Plastics in primary forms (11)	74	(part in) 13 Resin and Rosin and Rubber and Foam and Film and Elastomeric Materials	176
32 Laboratory material, Laboratory technology	1,124	x	x	38 Laboratory, optical and precision equipments (excl. glasses) (262)	262	41 Laboratory and Measuring and Observing and Testing Equipment	1,329

eCl@ss 6.0.1 EN	Number of bricks	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes
33 Installation (complete)	364	x	x	x	x	(part of) 26 Power Generation and Distribution Machinery and Accessories (419), others distributed in various segments	419
34 Medicine, medical technology, life science	2,737	(part in) 51 Healthcare (135)	135	(part in) 33 Medical equipments, pharmaceuticals and personal care products (603)	603	42 Medical Equipment and Accessories and Supplies (2404), 51 Drugs and Pharmaceutical Products (1765)	4,169
35 Semifinished products, materials	194	x	x	x	x	x	X
36 Machine, apparatus	1,529	x	x	(part of) 42 Industrial machinery (504)	504	(part of) 23 Industrial Manufacturing and Processing Machinery and Accessories (621), (part of) 24 Material Handling and Conditioning and Storage Machinery and their Accessories and Supplies (283), (part of) 26 Power Generation and Distribution Machinery and Accessories (419)	1,323
37 Industrial piping	390	(part in) 79 Plumbing/Heating/Ventilation/Air Conditioning (75)	75	(part of) 42 Industrial machinery (504)	504	(part in) 40 Distribution and Conditioning Systems and Equipment and Components (437)	437

eCl@ss 6.0.1 EN	Number of bricks	GPC 30062008	potential no. of classes	CPV 2008	potential no. of classes	UNSPSC v11 EN	potential no. of classes
38 Inorganic Chemicals	1,315	x	x	(part of) 24 Chemical products (259)	259	(part of) 12 Chemicals including Bio Chemicals and Gas Materials (377)	377
39 Organic Chemicals	5,112	x	x	(part of) 24 Chemical products (259)	259	(part of) 12 Chemicals including Bio Chemicals and Gas Materials (377)	377
40 Occupational safety, accident prevention	468	(part in) 63 Footwear (14), 67 Clothing (48), 85 Safety/Protection - DIY (18), 91 Safety/Security/ Surveillance (51)	131	18 Clothing, footwear, luggage articles and accessories (160), 35 Security, fire-fighting, police and defence equipment (175)	335	(part of) 46 Defense and Law Enforcement and Security and Safety Equipment and Supplies (277)	277
41 Marketing	420	x	x	x	x	(part of) 82 Editorial and Design and Graphic and Fine Art Services (169), (part of) 55 Published Products (112)	281
90 Interim class (unclassified)	1	58 Cross Segment	2	x	x	x	X
Total number of classes	27,053		2,222		8,138		36,016

Figure 35 - Coverage of eCl@ss segments

The figures show which segments are covered by the other standards giving only a very rough idea of the extent of the coverage by the potentially matching commodity classes listed. Of course, keywords, properties and values are not being regarded here. The grey fields show the segments that are completely missing in the other standards.

Below a comparison of strengths and weaknesses of the four standards is listed.

5.1.4.5 Coverage of segments by other standards: summary with regard to content

5.1.4.5.1 UNSPSC

Strengths UNSPSC

- The UNSPSC has the broadest approach with the highest number of segments (55)
- It covers almost all of the segments of the other standards (exception see below)
- Its biggest segment is the food/beverage/tobacco-segment with more than 17,000 classes of 38,000 in total. It is also the biggest segment of all the four standards in total. This is due to the fact, that in UNSPSC version 11 this segment was massively increased
- Another strength are services, covered by 19 service-related segments (# 70-94) with 3,149 classes
- Big segments include
    - Food/Beverage/Tobacco
    - Manufacturing components
    - Laboratory
    - Medical Equipment
    - Drugs/Pharmaceuticals
    - Music/Art

Weaknesses UNSPSC

- Exclusive class structure makes a cross-reference more difficult, as it is not comparable to the use of properties. This is not inherently a weakness of the standard, as it is not in scope of the UNSPSC. But in terms of comparability, it is a weakness for the project work.
- The distribution of included classes is very wide in the UNSPSC with a maximum of 16,921 (segment food, beverage, tobacco) and a minimum of 36. The next highest number of classes after the maximum is 2,404. 50% of all segments have less than 237 classes so that the different segments are not comparable to each other.
- Small segments include
    - GPC's segment #74 "Camping" (34 classes), which is represented in #4912 "Camping and outdoor equipment and accessories" (12 classes)
    - GPC's segment #81 "Lawn/Garden Supplies" (206 classes), which is represented in #271120 "Agriculture, forestry and garden hand tools" (39 classes)
- Missing in the UNSPSC are:
    - eCl@ss's segment #35 "Semifinished products, materials" (194 classes)
    - a dummy segment/class for new, currently unclassified content like GPC's #58 "Cross segment" or eCl@ss's #90 "Interim class (unclassified)", which is a question of the approach and not of missing content

5.1.4.5.2 eCl@ss

Strengths eCl@ss

- eCl@ss has a very elaborate amount of descriptive properties and values that are not considered in this analysis due to the fact, that the coverage of segments was in focus
- eCl@ss covers 45 out of 55 UNSPSC segments, having the broadest coverage after the CPV
- Most of the segments represented by eCl@ss are widely covered with a massive amount of potential commodity classes, various of them stronger than the UNSPSC itself
- The biggest UNSPSC segments after food/beverage/tobacco (Manufacturing components, Laboratory, Medical Equipment, Drugs/Pharmaceuticals) are also well covered in eCl@ss
- Big segments include:
    - Chemicals
    - Machinery
    - Manufacturing
    - Laboratory
    - Medical equipment

Weaknesses eCl@ss

- eCl@ss has the lowest amount of own segments (27), even though it covers the content of 45 out of 55 UNSPSC segments
- Services in eCl@ss have an inconsistent structure. Of the 10 missing UNSPSC-segments in eCl@ss, 6 are service-related. eCl@ss does therefore not cover all of the UNSPSC's 19 service-related segments (# 70-94, total no. of classes: 3,045), even though it contains 2,095 service-related classes in total. eCl@ss differentiates segments along the requirements of different markets. Thus, there is until now no differentiation between materials and products of a market and the related services. Therefore, the current structure does not allow a wider approach to integrate services on a broader level.
- eCl@ss has the lowest coverage in the food/beverage/tobacco-segment, its latest new segment
- Missing in eCl@ss are:
    - Music, Art, Games, Culture (UNSPSC segment #60)
    - Timepieces, Jewelry, Gemstone (part of UNSPSC segment #54)
    - Sports and Recreational Equipment (UNSPSC segment #49), including camping
    - Farming, Fishing, Forestry, Wildlife Machinery (UNSPSC segment #21)
    - Live Plant and Animal Material (UNSPSC segment #10), including pet care and food
    - Personal Care (incl. Beauty) Products (part of UNSPSC segment #53, GPC's segment #53)
    - 6 service-related segments
        - Farming and Fishing and Forestry and Wildlife Contracting Services (UNSPSC segment #70)
        - Mining and Oil and Gas Services (UNSPSC segment #71)
        - Industrial Production and Manufacturing Services (UNSPSC segment #73)
        - Public Utilities and Public Sector Related Services (UNSPSC segment #83)
        - Politics and Civic Affairs Services (UNSPSC segment #93)
        - Organizations and Clubs (UNSPSC segment #94)

5.1.4.5.3 GPC

Strengths GPC

- The GPC is closely related to the UNSPSC
- It contains a lot of class descriptors and values that give its classification a high granularity, but that are not considered in this analysis due to the fact, that the coverage of segments was in focus
- Big segments include:
    - Sports and Recreation with Camping being a segment of its own and big in relation to the other standards
    - Food/Beverage/Tobacco
    - Automotive
    - Beauty and Personal Care
    - Building Products
    - Homecare

Weaknesses GPC

- The GPC has only 36 segments of its own
- The GPC includes only 2,923 commodity classes, the lowest amount of commodity classes
- The GPC covers only 22 out of 55 UNSPSC-segments, 15 out of 45 CPV-segments and 14 out of 27 eCl@ss -segments, having the lowest coverage
- Small segments include
    - #60 "Textual/Printed/Reference Materials" with 11 classes
    - #63 "Footwear" with 14 classes
    - #87 "Fuels" and #88 "Lubricants" with 12 and 15 classes
- Missing in the GPC are:
    - Services are totally missing in the GPC and are out of scope
    - Chemicals
    - Mineral and metal products (CPV #14 "Mining, basic metals and related products")
    - Paper materials
    - Packing Material (eCl@ss #20 "Packing material")
    - Semifinished Products (eCl@ss #35)

- Polymers, rubber and foam and fabrics incl. leather and textile (CPV #19 “Leather and textile fabrics, plastic and rubber materials”)
- All machinery and manufacturing components and accessories classified in the other standards, e.g.
  - UNSPSC #20 Mining machinery
  - UNSPSC #21 Farming, Fishing, Forestry Machinery
  - UNSPSC #23 Industrial Manufacturing
  - UNSPSC #24 Material Handling, Storage
  - UNSPSC #26 Power Generation
  - UNSPSC #31 Manufacturing Components
  - UNSPSC #48 Service Industry Machinery
- Laboratory Equipment
- IT/Telecommunications
- Electronic Components (UNSPSC #32 “Electronic Components and Supplies”)

5.1.4.5.4 CPV

CPV

Strengths CPV

- The CPV has 45 segments of its own, being second after the UNSPSC
- The CPV covers almost all UNSPSC segments (50 out of 55) and has a very broad approach
- It contains a supplementary vocabulary to further distinguish classes, which is not considered in this analysis due to the fact that the coverage of segments was in focus[30].
- It covers all UNSPSC services with 2,933 commodity classes (in comparison: 3,045 UNSPSC services)
- Big segments include
  - Building and Construction
  - Furniture and Office Equipment
  - Medical Equipment/Pharmaceuticals
  - Transport Equipment
  - Industrial Machinery
  - Repair and Maintenance Services
  - IT Services
  - Cleaning and Environmental Services

Weaknesses CPV

- The CPV only comprises 8,137 classes. Its properties do not result in a higher granularity, though, as most of them describe the application area and do not describe the product class itself (comparison on properties-level is out of scope of this analysis)
- Small segments include:
  - Machine element, fixing, mounting (eCl@ss‘s segment #23) with 15 classes
  - Baby care products with 4 classes
  - Laboratory Equipment with 262 classes (eCl@ss: 1,124; UNSPSC: 1,329)
  - Cleaning equipment (UNSPSC’s segment #47) with 22 classes
  - Kitchen and household equipment with 62 classes
  - Research and development services with 14 classes (segment #73)
  - Public Utilities with 4 classes (segment #65)
- Missing in the CPV are
  - Power generation
  - Tools
  - Certain Machinery Areas
  - Material Handling
  - Lawn/Garden Supplies (GPC’s segment #81)
  - eCl@ss‘s segment #35 “Semifinished products, materials” (194 classes)
  - a dummy segment/class for new, currently unclassified content like GPC’s #58 “Cross segment” or eCl@ss’s #90 “Interim class (unclassified)”, which is a question of the approach and not of missing content

[30] The CPV’s supplementary vocabulary is a mixture of properties and value lists and it is not comparable to what eCl@ss and GPC have developed.

- Pet Care and Food (GPC's segment #10)
- Electronic Components (UNSPSC #32 "Electronic Components and Supplies")

5.1.5 Summary

5.1.5.1 General

As shown above, the four different leading classification systems in Europe have different focuses and approaches and their structure varies as well. Their strengths and gaps in the content were identified above.

A major difference lies in the structure of integrated services, as eCl@ss has a totally different approach to services than the UNSPSC and CPV. Both the UNSPSC and the CPV distinguish between product-related and service-related segments that might represent the same market. That is why the UNSPSC contains 19 service-related segments and the CPV has 21. This leads to a higher amount of segments, as e.g. the CPV has a segment "Transport equipment and auxiliary products to transportation" (#34) for materials and products and an additional segment "Transport services (excl. Waste transport)" (#60) for the related services. eCl@ss also distinguishes its segments along different markets, e.g. segment laboratory material, industrial piping or construction technology. But it has only one segment "Service" (25) including all services for all the different branches[31]. In addition, repair and maintenance services are found throughout the whole eCl@ss standard as descriptive class codes (-95, -96-, -97-, -98- and -99-) related to the relevant commodity classes (e.g. codes xx-xx-98-xx for maintenance, codes xx-xx-99-xx for repair services or codes xx-xx-95-xx for training services). In contrary the CPV has its own segment "Repair and maintenance services".

> Example:
> The CPV has the classes 50312300-8 "Maintenance and repair of data network equipment" and 50512000-7 "Repair and maintenance services of valves" both in segment 50. eCl@ss knows the two classes 19179800 "Network technology (computer communication, maintenance, service)" and 37019803 "Butterfly valve (maintenance, inspection)" in two different segments 19 ("Information, communication and media technology") and 37 ("Industrial piping").

Apart from the structure of the service integration, the content of service-related classes is
- very elaborate in the UNSPSC
- very elaborate in the CPV
- less elaborated in eCl@ss
- completely missing in the GPC

Regarding the segments in focus of this CWA the following results can be mentioned.

5.1.5.2 Domain Food/Beverage/Tobacco

This segment is
- very well covered and currently the biggest segment of the UNSPSC (and the biggest segment of all standards)
- well covered by the GPC
- well covered by the CPV
- the smallest segment of eCl@ss and can still grow a lot, as it is not yet well covered

5.1.5.3 Electronics

This segment has to be divided into consumer electronics (for entertainment, communications and office use) and electronic components that are integrated into an electronic circuit, such as resistors, transistors, diodes etc., which are to be found in the UNSPSC-segment #32 "Electronic Components and Supplies".

Electronic components are:
- well covered by the UNSPSC
- well covered by eCl@ss
- missing in the GPC
- missing in the CPV

[31] The great exception to be named here is segment 22 "Construction technology" including construction work services, as this segment was once harmonized with the bau:class standard (www.bauclass.de)

Consumer electronics are:
- well covered by the UNSPSC (#43 IT, Broadcasting, Telecommunications, #44 Office Equipment, #45 Printing, Photographic, Audio, Video Equipment)
- well covered by eCl@ss (#19 IT, communication, media technology, #24 Office technic)
- partly covered by the GPC (#68 Audio Visual/Photography, #62 Stationery/Office Machinery/Occasion Supplies; IT/broadcasting, telecommunications are missing)
- covered in the CPV (#30 Office/computing, #32 Radio/TV/communication/telecommunication)

5.1.5.4 Energy (electricity, gas)

This segment is:
- well covered by the UNSPSC including only segments #11 Mineral and Textile and Inedible Plant and Animal Materials and #15 Fuels and Fuel Additives and Lubricants and Anti corrosive Materials and #20 Mining and Well Drilling Machinery and Accessories including oil and gas drilling equipment and #26 Power Generation and Distribution Machinery and Accessories
- well covered by eCl@ss in segment #26 Energy, extraction product, secondary raw materials and residues and #36 Machine, Apparatus
- only partly covered by the GPC including only segments #87 Fuels and # 88 Lubricants with power generation including electricity and gas totally missing
- covered by the CPV including segments #09 Petroleum products, fuel, electricity and other sources of energy and #14 Mining, basic metals and related products and parts in #42 Industrial Machinery (including nuclear reactors, gas generators etc.), as well as #43 Machinery for mining, quarrying, construction equipment

5.1.5.5 Furniture

This segment is:
- well covered by the UNSPSC
- well covered by the GPC
- well covered by the CPV
- partly covered by eCl@ss, as only certain special furniture areas are included in other segments (laboratory, office and medical furniture)

5.1.5.6 Laboratory Equipment

This segment is:
- well covered by the UNSPSC
- well covered by eCl@ss
- missing in the GPC
- covered in the CPV

5.1.5.7 Clothing

This segment is:
- well covered by UNSPSC in segment #53 Apparel and Luggage and Personal Care Products
- partly covered by eCl@ss in segments #40-01 work clothing and #24-36 bag, case incl. suitcases
- covered by the GPC in segment # 67 Clothing
- well covered by the CPV in segment #18 Clothing, footwear, luggage articles and accessories

The results are summed up in Figure 36.

	unspsc	eCl@ss	GS1 GPC	CPV
Coverage	- Has the broadest approach with highest number of segments (55) - It covers almost all segments of the other standards (except one) - Services are well-covered in 19 service-specific segments	- Covers 45 out of 55 UNSPSC segments - Covers 40 out of 45 CPV segments - Big UNSPSC segments are well covered as well (except FBT) - Distribution of classes is rather equal, i.e. the covered segments all have a rather big amount of classes, some bigger than the UNSPSC segments - Contains descriptive properties and values	- Closely related to the UNSPSC - Contains class descriptors which results in high granularity	- Very broad approach - Covers 45 segments of its own and covers almost all UNSPSC segments (50 out of 55) - Covers all UNSPSC services - Contains supplementary vocabulary to further distinguish classes
Big segments	- Food/ Beverage/Tobacco - Manufacturing comp. - Laboratory - Medical Equipment - Drugs/Pharmaceuticals - Music/Art - -Services	- Chemicals - Machinery - Manufacturing - Laboratory - Medical equipment	- Sports/Recreat. - Food/Beverage/Tobacco - Beauty/Personal Care/Hygiene - Building Products - Homecare - Automotive	- Building/Construction - Furniture/Office Equip. - Medical Equip./Pharm. - Transport Equipment - Industrial Machinery - Repair/Maintenance Services - IT Services - Cleaning/Environm. Services
Weakness	- exclusive class structure makes a cross-reference more difficult, as it is not comparable to the use of properties (no weakness of the standard, but for the comparison) - the distribution of classes is very	- lowest amount of own segments (27), even though it covers the content of 43 out of 55 UNSPSC segments - Services are under-represented and their structure is inconsistent, therefore coverage	- Only 36 segments of its own. - Includes only 2,923 commodity classes - Covers only 22 out of 55 UNSPSC segments	- Comprises only 8,137 classes, which cannot be compensated by its properties, as they are not very descriptive - The Distribution of classes is very wide and some

	unspsc®	eCl@ss® CLASSIFICATION AND PRODUCT DESCRIPTION	GS1 GPC	CPV
	wide and not at all equal (min. 36, max. 16,921)	of services not very broad - Coverage in the FBT the FBT-segment rather weak as it is smallest and newest segment	- Covers only 15 out of 45 CPV segments - Covers only 14 out of 27 eCl@ss segments	segments are too small (22 segments with less than 100 classes, 5 < 20 classes, 2 < 5 classes)
Missing segments	- Semifinished products and materials (eCl@ss #35) - Dummy segment (e.g. GPC: cross segment , eCl@ss: interim class (unclassified)	- Music/Art/Games/Culture - Jewelry/ Gemstones - Sports & Recreation - Farming/Fishing/Wildlife - Live Plant and Animal Material - Personal Care Products - 6 Service-related segments	- Services - Chemicals, polymers Polymers - Mineral/Metal products - Packing Material - Semifinished Products - Paper - Machinery & manufacturing - Laboratory Equipm. - IT/Telecomm. - Electronic components	- Power generation - Tools - Certain Machinery Areas - Material Handling - Semifinished Products - Pet Care and Food - Electronic Components - Lawn/Garden Supplies - Dummy segment (e.g. GPC: cross segment , eCl@ss: interim class (unclassified)

Figure 36 - Comparison - strengths and weaknesses

5.1.6 Recommendations

5.1.6.1 General

In order to improve interoperability between the four different standards UNSPSC, eCl@ss, GPC and CPV we suggest certain changes that will help to compare the standards in a better way. Some recommendations are more of a technological kind. Others refer to the content and identified gaps. The latter are mentioned separately for each standard.

5.1.6.2 Recommendations for all standards

First, there are certain recommendations to be made that are valid for all standards.

1) Introduction of an international, standardized data model
   In order to be fit for the future a standard should be based on an international, standardized data model like those that have been published in recent years, like e.g. ISO 13584[32], which is recommended by the CEN ISSS Workshop eCAT-ePPS. The advantage is that ISO is the standardization body on the highest level and represents the widest common opinion, therefore being a standard that stands for continuity, a global consensus and sustainability. If every standard introduces its own data model, interoperability will always be difficult due to severe structural changes. It will also help develop and change a standard and, at the same time, document how and why changes were made.

2) Introduce the same data model or try to be compatible/interoperable
   Of course, the best way would be for all four standards to introduce the same data model in order to make them inherently interoperable on a technical scale. This would help to harmonize the content subsequently. A migration policy should then be defined to help change from one data model to the common one. A memorandum of understanding could be signed by the registration authorities to give the agreement an official frame.

3) Use an identification scheme (unique identifiers) in addition to class numbers
   Every structural element used should have a unique identifier that will be valid in every release and every publication. Any change of content and structure has to be documented with the help of transaction update files. If only e.g. a class number changes, then the user will have no information that a certain class was just moved to a different spot in the classification hierarchy, even though the content itself has not changed. This class's unique identifier is the basis for a change management that is transparent and can be automatically processed by the user in his applications so that an upgrade is always possible. With the unique identifier the element (in this case: class) can be identified in any release and compared with the help of a version number. We therefore fully agree with the recommendation made in the CEN ISSS WS eCAT-ePPS final CWA that the international standard ISO 29002 should be taken as the standard for identifying objects[33] as it includes all necessary information for an upgrade process.

4) Introduce or adjust to a standardized maintenance process
   The maintenance process of a standard should be clear, transparent and free of doubts. The CEN ISSS WS eCAT-ePDC recommended a maintenance process based on ISO Guide 69 in its CWA published in 2005[34]. It is similar to the process used in the DIN Property Server[35] and in eCl@ss.

5) Introduce naming principles
   The analysis in 5.2.4.3 has shown that in none of the standards a consistent naming scheme is existent. eCl@ss has introduced rules for the naming of classes and properties and the definitions of properties[36], but they are not consistently executed. Certain rules, such as a default singular vs.

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[32] More information and a description as well as recommendations are found in CWA ePPS (number to be added) p10ff: "ISO 13584 is a standard which provides a formal data model for dictionaries and libraries, i.e. for both the metadata and the actual product data". eCl@ss has introduced this data model in release 6.0

[33] CWA ePPS CWA xxx 2010, p.49ff

[34] CWA 15295:2005, p.35f

[35] see www.dinsml.net

[36] According to the DIN4002, see www.dinsml.net

plural naming[37] have to be introduced to make standards comparable. E.g. the CPV uses information in brackets such as (incl.), (excl.), (except), (additional info) etc. to make certain classes more specific. The purpose here is to facilitate translations as the CPV is available in 22 official European languages. This could be a strategy that the other standards could adopt in order to facilitate translations and the international distribution of standards, as well as improve the interoperability between the standards. Of course, a common set of naming principles would facilitate an automatic mapping between the standards.

6) Follow the rule of unique placement
An important rule that follows the naming principles is the unique placement, i.e. the user of a classification system shall only be able to classify his product in one single class. One product shall only have one code and not more than one. If a product could be classified in different classes within the same classification system, unique placement is not guaranteed and data exchange is not possible, as different users might use different codes for the same product. A naming principle to avoid this could be to only allow one class with the same name.

7) Introduce classificatory principles
To be able to understand und fully interpret the way a classification concept is built, a standardization authority should publish its classificatory principles. These describe the semantic and ontological basis the classification is created on. Different classification systems divide reality along different rules, so one and the same class might be embedded in a totally different hierarchy of classes or one and the same product would be classified in a totally different way – even if the underlying data model was the same. This is the fundamental barrier for establishing interoperability via e.g. a mapping table, as the rules to classify reality are different. If all standards were based on the same classificatory principles like e.g. an international standard, then interoperability would be made easier, even though this might hardly be possible.

8) Introduce a single common library of terms and definitions
In order to compare standards and make them interoperable, the relevant standards should use the same terminology to describe their concepts. As shown in part 4 the four classification standards mentioned here speak of classes as commodities, bricks, segments, families, divisions etc. and use certain characteristics attached to these classes which they name properties, attributes, secondary vocabulary or class descriptors. This does not help to compare them. A powerful tool to help here, could be the ISO Concept Database (ISO/CDB), which was just recently released in October 2009 and is a web-based data base for the development, standardization and publication of standardized „concepts“. The goal of the ISO/CDB is to standardize and publish common concepts on an international basis and make them available to users via a web-database. The definitions for the term “domain” (Part 3.1) were found in the ISO/CDB.

9) Deliver a definition for each class
Each class shall be further described with the help of a definition to be attached to every class in addition to the class name. This will help to understand how to interpret the class and which products to describe with it. Using product classes to classify one’s products just with the help of a name can be difficult and very ambiguous for the user, as various classes might be chosen for the same object.

10) Add keywords to classes
Additional keywords should be added to every class, as not only one single term is the appropriate one to describe an object. If a variety of terms – even specialists use different terms, especially in different stages of the supply chain – guarantees a higher success rate to really describe a product class. Keywords will help to improve the search function and help find the right class for each product. A good example is eCl@ss, using already more than 52,000 keywords for about 32,000 classes – only in the English language[38].

[37] E.g. an eCl@ss rule states that all classification classes are to be named in singular form only. In the releases 6.1 and 6.2 that were published during the project runtime, a lot of corrections were made in order to fulfil the regulatory requirement.

[38] So far, eCl@ss contains more than 350,000 keywords for 32,000 classes in 10 languages.

11) Add images to classes
Additional images like schemas or industrial examples representing a product class will help to describe a class, as words can always be interpreted in many ways. In addition, translation of terms will be made a lot easier, so that the quality of different language versions will massively improve[39].

12) Separate application area from class description
As shown in 5.2.3.2 classification classes in the UNSPSC, the GPC and eCl@ss contain information about the application area of the classes, whereas the CPV has a different strategy in using its supplementary vocabulary to deliver this information. Most of the CPV's properties are named "for … use". We suggest that a common way to deliver the information of the application area should be introduced. A way could be to use properties, but in this case they would have to be separated from descriptive properties that deliver information to the product itself.

13) Add information in brackets for translational purposes
The information delivered in brackets in the CPV is a very good instrument to improve the possibility for translations (The CPV is available in 22 official European languages). This rather appropriate measure could be adapted by the other standards in order to maintain better translations

14) Introduce a translation process to improve language versions
In order to make every standard accessible to an international market and more interoperable in a global community, the standard agencies should develop translation processes to improve the quality of the different language versions of their standard. It could include information about the quality and quantity of translations, e.g. to distinguish, if a language version was created by translation applications, translation agencies, non-native experts, native experts etc.

5.1.6.3 Recommendations for the CPV

1) The CPV has introduced in its current version 2008 a supplementary vocabulary which contains properties to describe product classes. This was a very good step, but the use of properties is not yet comparable to those in the GPC or eCl@ss. First, every item of the supplementary vocabulary can be combined with each class, without the CPV giving relations between classes and specific properties. Second, the majority of the CPV-properties are not descriptive, but describe only the application area of a product class, i.e. 327 of the 903 properties of the CPV describe the application area, e.g. "For public economics" (RB18-1), "For private economics" (RB19-4), "For market economics" (RB20-7) etc. Apart from that, about 20 properties describe the type of packaging like "In cartons" (BC21-4), "In packets" (BC27-2) etc. The supplementary vocabulary could be used in a much more effective way to further describe product classes with the help of a more elaborate amount of descriptive properties and value lists. The GPC and eCl@ss could serve as a basis.

2) Furthermore, the CPV could think about restructuring the properties and distinguish between properties and values like the GPC and eCl@ss do. This would enhance the amount of information delivered within the description and structure it in a very positive way. E.g. properties like "Gold", "Silver", "Platinum" would be a value list of the property "Material" or "With metal frames", "With plastic frames" and "With wooden frames" could be the value list "metal", "plastic" and "wooden" of a property "Frame type".

3) As already mentioned, the CPV contains properties for the application areas of products. It is recommended to keep this structure

4) The CPV should integrate and refer to as many existing international standards as possible, both concerning its structure, its data model and the content (e.g. ISO 13584, ISO 29002 et al.). To use e.g. standardized properties to further describe classification classes (like e.g. eCl@ss uses DIN-properties), or standardized values lists (e.g. RAL-values for colours) as well as e.g. ISO country and language codes (ISO3166 and ISO 639-1) will always lead to more interoperability. In the wide field of standards, one should rely on what already exists. Furthermore, we suggest cooperating with other registration authorities or relevant standardization bodies. A success story for cooperation in this field is eCl@ss, which has been harmonizing and cooperating with a lot of branch standards for years and relies on international ISO standards as mentioned in 4.1

[39] eCl@ss has introduced this possibility with version 6.0, but has not yet defined a process to integrate images.

5) The CPV should, if not in scope yet, introduce rules and regulations (guidelines) to define the structure, terminology and semantic outline etc., e.g. the usage of both the singular and plural forms of product classes is confusing and does not help in searching products.

6) The class hierarchy of the CPV is very complex and more granular than in the other standards. After the first two digits representing a segment, each digit is a separate level. Nevertheless, not every level is filled with classes, so that the content is not equally distributed on all class levels, e.g. 1,319 of 9454 classes are not further distinguished after the 3rd level. If the structure was simpler and contained a 4-level-hierarchy with an equal distribution of classes on the 4th level like the other three standards, the CPV would gain a lot more interoperability. At least, there should be no division (1st level) without classes on the lowest level like e.g. division 41 “Collected and purified water”

7) Furthermore, the distribution of classes should be comparable between the different segments. There are 22 segments with less than 100 classes, five of them with less than 20, the maximum being more than 40 times bigger than that. Also, two segments contain less than five classes – a fact that raises the question, if they are legitimate segments. No segment with less than 20 classes should exist. It is therefore recommended to either join these segments with related segments or enhance them, so that a higher amount of classes represents a segment.

8) Among the valid punctuation marks used in the CPV are the colon and the semicolon. We recommend deleting both of them in every text field as they might be interpreted as control characters by certain databases and in the electronic exchange.

9) Maintenance process
As mentioned above, the CPV like any other standard should rely on established and recommended standards, which is also true for the maintenance process (a WS eCAT-ePDC proposal already being mentioned above). This, in combination with the cooperation with other standards, could be used to facilitate the integration of other standards’ content and hence, their interoperability. If the industry-standards and the CPV would define a certain synchronisation point in their development workflows, the faster developing industry-driven standards could deliver a lot of content to the CPV. As a result, the CPV would not have to develop the content itself, but to simply adjust the requirements of the industry, which are then already integrated in the GPC, the UNSPSC or eCl@ss, to the rules of the CPV. Thereby, the CPV would benefit from the industry standards, grow fast and contain the latest required information. This recommendation aligns with those made by the European Commission itself published recently in its e-Catalogue Feasibility Study. This study considers among other things – as the PEPPOL project does as well – to combine the CPV class structure, as it is already mandatory for public procurement, with sets of properties that are well developed in the eCl@ss standard. This way, a higher acceptability of the user can be achieved, as the CPV classes in combination with eCl@ss properties can be used by the market for various purposes, going beyond the simple mandatory usage of the CPV that is additional and therefore unwelcome work for the industry.

10) The CPV could add missing areas of EU-interest and map or harmonize the content with one of the other existing classifications. As the CPV has introduced properties, this should not be restricted to a class structure like the UNSPSC. Segments to be considered for an enhancement of the CPV are:

- Tools
- Certain Machinery Areas
- Material Handling
- Semi-finished Products
- Pet Care and Food
- Electronic Components
- Lawn/Garden Supplies
- Optionally a dummy segment (e.g. GPC: cross segment, eCl@ss: interim class (unclassified)

5.1.6.4 Recommendations for eCl@ss

1) As mentioned above, eCl@ss has a very inconsistent structure of the service-related classes. Plans to change this are currently made and due to be implemented in the next Major Release 7.0, which shall be published in November 2010. eCl@ss should think about adapting the way that both the CPV and the UNSPSC have organized their service structure.

2) eCl@ss has created a lot of rule sets on how to design the standard, i.e. how to name classes and properties, how to distinguish classes from properties etc. Apart from that eCl@ss was developed according to the needs of the industry itself, which were sometimes contradictory to its rules. This is due to the fact that an industry-driven standard has to deal with compromises. After all, eCl@ss has a very elaborate rule set which should be applied in a more consistent way. E.g., properties should not be part of a class name, as eCl@ss has the possibility to distinguish between those. The application area of a product should not be part of a class name, as the product class shall be described exclusively by its properties and not by the area of application. A similar product might be represented in different application-area classes, but described in the same way. A different way to deliver the information regarding the area of application of a product class should be found.

3) The latest new segment food/beverage/tobacco should be enhanced as it is the smallest segment. All the other standards cover this segment much better.

4) eCl@ss should consider creating new missing segments like sports equipment, music, art, culture etc. in order to improve interoperability.

5.1.6.5 Recommendations for the GPC

1) The GPC has the lowest coverage of domains of all four standards. It seems that machinery, chemicals, polymers and laboratory equipment are out of scope of the GPC.

2) Apart from that, the GPC does not have services in its portfolio.

3) It should consider to take other structures such as UNSPSC, eCl@ss or CPV as a basis, if the scope will be enhanced to those areas currently missing in the GPC

5.2 Analysis at class level – similarities and differences

5.2.1 General

Many companies are using (product) classification systems to categorize and describe their products and services. Especially in the area of electronic business product classification systems serve as source for the superordinate description of products and services and as this facilitates the exchange of information about products between trading partners.

Beside a huge number of industry or sector specific classification systems, so called vertical classification systems, there are also a number of industry or sector independent classification systems, so called horizontal classification systems.

The mostly known independent classification systems are CPV, eCl@ss, GPC and UNSPSC.

In Section 5.1 there is an overview given about differences and similarities about the structure of these four independent classification systems, called “analysis of the domain level”. In this section this analysis will be improved and extended to the class level. This means that not the overall structure of the classification systems will be the focus but the entities to describe specific products. These entities are called different by the given classification systems:

- CPV: commodities
- eCl@ss: commodity classes
- GPC: bricks
- UNSPSC: commodities

To facilitate the wording and understanding, the last level of the investigated classification systems will be called in this section “commodity classes”.

In opposite to mapping which is dealing with the finding codes of equivalent product classes inside different product classification systems, harmonization follows the approach to combine the product description of the different product classification system inside one concept. This approach also has been taken within the following analysis, especially the semantical analysis, where classes with the same meaning are combined to one consolidated product description. To do this a product class name has be chosen. After this all product class names given by the investigated product classification systems and not covered by this product class name has to be taken over in the synonym list of this class. This product class has to be extended by all attributes or properties given by the different classification systems with a consolidated set of attribute values.

Taking this approach, the mapping of product classification codes can be seen as the first step for a facilitated usage of the different product classification systems. But the mid or long term solution should be the harmonization of these product classification systems to reduce the number of product classification systems to be used within e-business and so prevent from generating different sets of product description for the different product classification systems.

5.2.2 Methodology of analysis

To reach a systematic analysis of the different aspects of the investigated classification systems a four step methodology has been used:

- Phase 1: Numeric analysis
- Phase 2: Syntactical analysis
- Phase 3: Semantic analysis
- Phase 4: Summary and recommendations

Within this four step approach the starting point will be the classification systems in its entirety. After this the analysis will concentrate on the commodity classes and its properties.

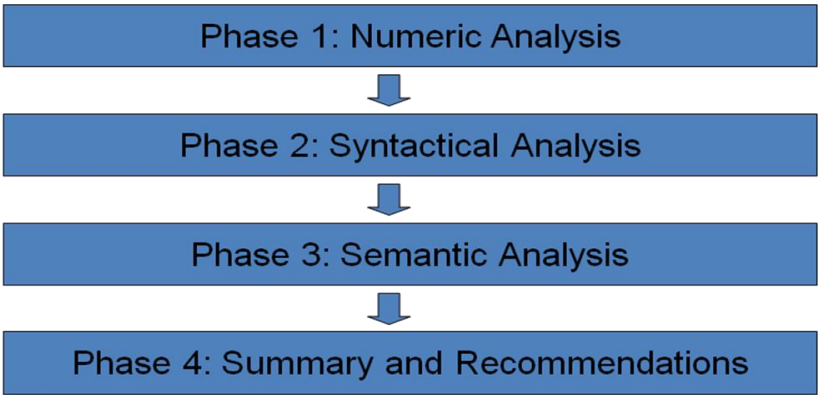


Figure 37 - Methodology of analysis

5.2.3 Phase 1: Numeric analysis

The first step of the analysis methodology deals with an overview of the four horizontal classification systems by some numbers.

In the first step an improvement on the structure of the classification systems is given in Figure 36.

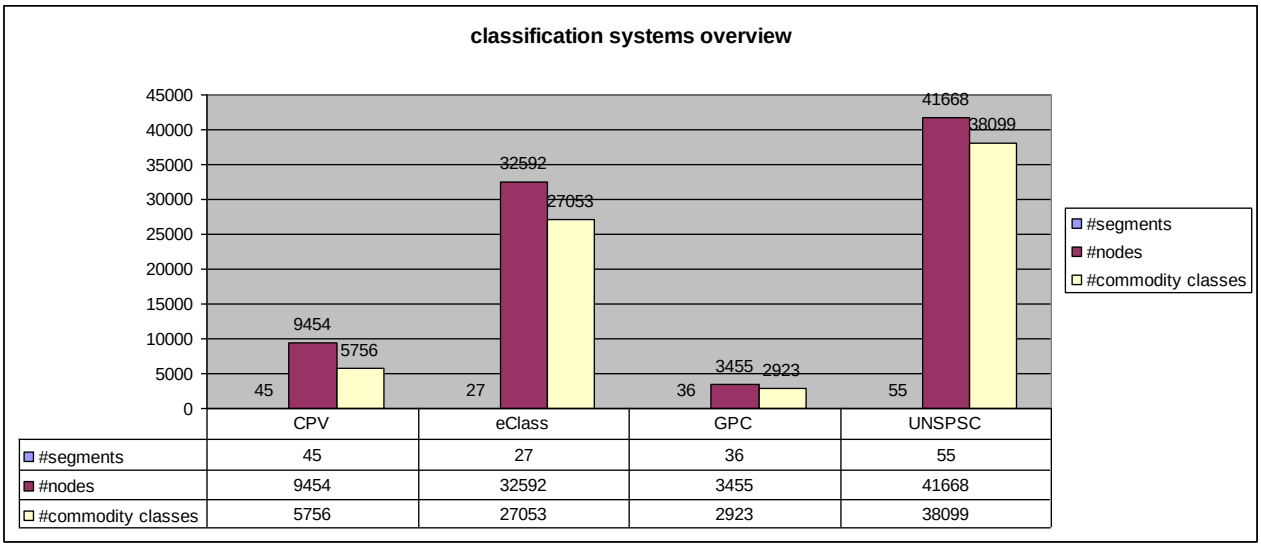


Figure 38 - Classification systems overview

At a first glance Figure 38 shows that UNSPSC is the biggest one of the four classification system followed by eCl@ss, CPV and GPC. Although this could lead to the conclusion that UNSPSC is also the most complete classification system, this conclusion cannot be drawn.

CPV Code	Description	Number of Nodes	Number of Groups	Number of Classes	Number of Categories	Number of Subcategories
03000000-1	Agricultural, farming, fishing, forestry and related products	230	4	16	47	162
09000000-3	Petroleum products, fuel, electricity and other sources of energy	94	3	11	26	53
14000000-1	Mining, basic metals and related products	148	8	27	61	51
15000000-8	Food, beverages, tobacco and related products	477	9	36	111	320

CPV Code	Description	Number of Nodes	Number of Groups	Number of Classes	Number of Categories	Number of Subcategories
16000000-5	Agricultural machinery	44	7	24	7	5
18000000-9	Clothing, footwear, luggage articles and accessories	194	8	25	86	74
19000000-6	Leather and textile fabrics, plastic and rubber materials	97	6	27	41	22
22000000-0	Printed matter and related products	109	8	25	51	24
24000000-4	Chemical products	292	7	25	59	200
30000000-9	Office and computing machinery, equipment and supplies except furniture and software packages	401	2	12	52	334
31000000-6	Electrical machinery, apparatus, equipment and consumables; lighting	363	7	33	78	244
32000000-3	Radio, television, communication, telecommunication and related equipment	226	4	25	74	122
33000000-0	Medical equipments, pharmaceuticals and personal care products	641	4	33	162	441
34000000-7	Transport equipment and auxiliary products to transportation	468	8	36	104	319
35000000-4	Security, fire-fighting, police and defence equipment	210	8	26	47	128
37000000-8	Musical instruments, sport goods, games, toys, handicraft, art materials and accessories	345	4	16	54	270
38000000-5	Laboratory, optical and precision equipments (excl. glasses)	316	9	44	114	148
39000000-2	Furniture (incl. office furniture), furnishings, domestic appliances (excl. lighting) and cleaning products	468	6	32	104	325
41000000-9	Collected and purified water	4	1	2	0	0
42000000-6	Industrial machinery	552	9	38	125	379
43000000-3	Machinery for mining, quarrying, construction equipment	127	8	23	45	50
44000000-0	Construction structures and materials; auxiliary products to construction (except electric apparatus)	539	8	33	94	403
45000000-7	Construction work	822	5	20	66	730
48000000-8	Software package and information systems	198	9	47	117	24
50000000-5	Repair and maintenance services	224	8	35	67	113
51000000-9	Installation services (except software)	110	9	25	44	31
55000000-0	Hotel, restaurant and retail trade services	39	6	15	14	3
60000000-8	Transport services (excl. Waste transport)	55	6	19	18	11
63000000-9	Supporting and auxiliary transport services; travel agencies services	85	3	7	27	47
64000000-6	Postal and telecommunications services	55	2	4	22	26
65000000-3	Public utilities	17	5	7	4	0

CPV Code	Description	Number of Nodes	Number of Groups	Number of Classes	Number of Categories	Number of Subcategories
66000000-0	Financial and insurance services	89	4	13	29	42
70000000-1	Real estate services	36	3	9	11	12
71000000-8	Architectural, construction, engineering and inspection services	184	8	21	49	105
72000000-5	IT services: consulting, software development, Internet and support	252	9	26	57	159
73000000-2	Research and development services and related consultancy services	26	4	7	14	0
75000000-6	Administration, defence and social security services	57	3	12	20	21
76000000-3	Services related to the oil and gas industry	67	6	19	26	15
77000000-0	Agricultural, forestry, horticultural, aquacultural and apicultural services	54	9	16	11	17
79000000-4	Business services: law, marketing, consulting, recruitment, printing and security	199	9	36	89	64
80000000-4	Education and training services	55	6	25	17	6
85000000-9	Health and social work services	98	3	10	20	64
90000000-7	Sewage, refuse, cleaning and environmental services	197	5	27	44	120
92000000-1	Recreational, cultural and sporting services	105	7	19	35	43
98000000-3	Other community, social and personal services	85	5	14	36	29
	Total	9454	272	1002	2379	5756

Figure 39 - CPV overview – part 1

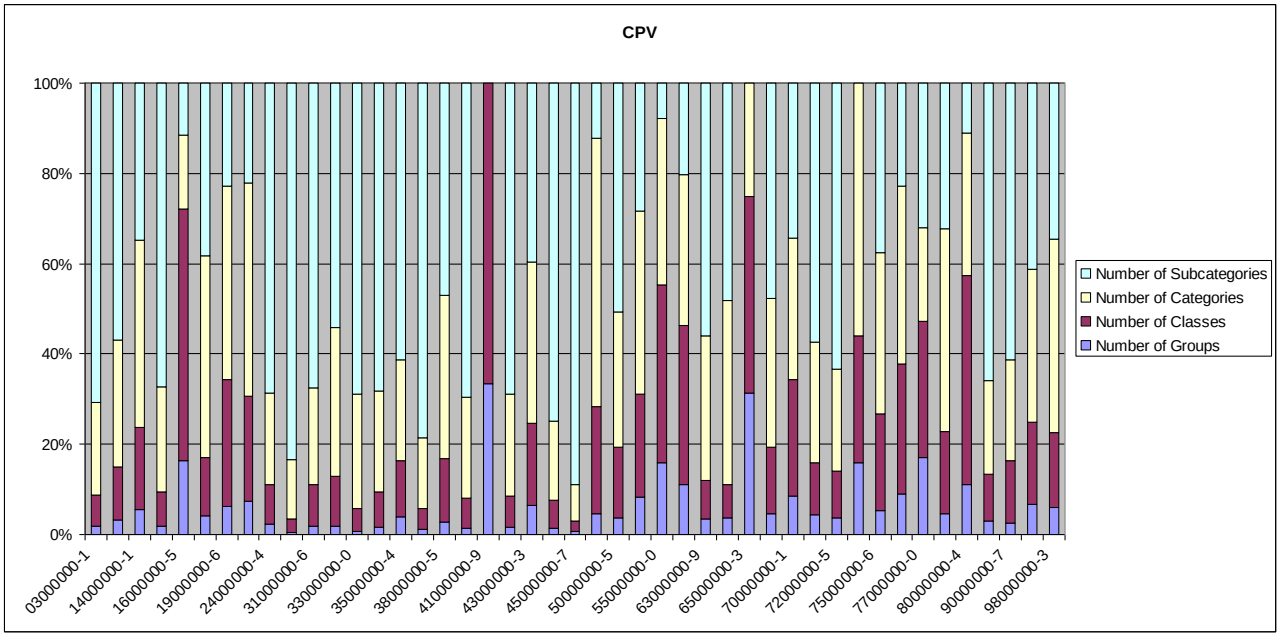


Figure 40 - CPV overview – part 2

eCl@ss Code	Description	Number of Nodes	Number of Main Groups	Number of Groups	Number of Commodity Classes
16000000	Food, beverage, tobacco	215	14	49	151
17000000	Machine, device (for special applications)	476	14	154	307
18000000	Equipment f. mining, metallurgical plant, rolling mill a. Foundry	431	15	130	285
19000000	Information, communication and media technology	1166	23	234	908
20000000	Packing material	785	43	174	567
21000000	Manufacturing facilities, workshop equipment, tool	1553	15	206	1331
22000000	Construction technology	1669	40	249	1379
23000000	Machine element, fixing, mounting	1217	34	242	940
24000000	Office products, facilities and technics, papeterie	1835	18	255	1561
25000000	Service	1363	22	235	1105
26000000	Energy, extraction product, secondary raw materials and residues	263	4	40	218
27000000	Electric engineering, automation, process control engineering	3107	35	498	2573
28000000	Automotive technology	255	11	72	171
29000000	Home economics, Home technology	422	13	72	336
30000000	Auxiliary supply, additive, cleaning agent	1268	24	175	1068
31000000	Polymers	726	45	181	499
32000000	Laboratory material, Laboratory technology	1328	18	185	1124
33000000	Installation (complete)	572	18	189	364
34000000	Medicine, medical technology, life science	3223	36	449	2737
35000000	Semifinished products, materials	260	5	60	194
36000000	Machine, apparatus	2015	37	448	1529
37000000	Industrial piping	521	15	115	390
38000000	Inorganic Chemicals	1464	19	129	1315
39000000	Organic Chemicals	5386	19	254	5112
40000000	Occupational safety, accident prevention	561	8	84	468
41000000	Marketing	507	13	73	420
90000000	Interim class (unclassified)	4	1	1	1
	Total	32592	559	4953	27053

Figure 41 - eCl@ss – part 1

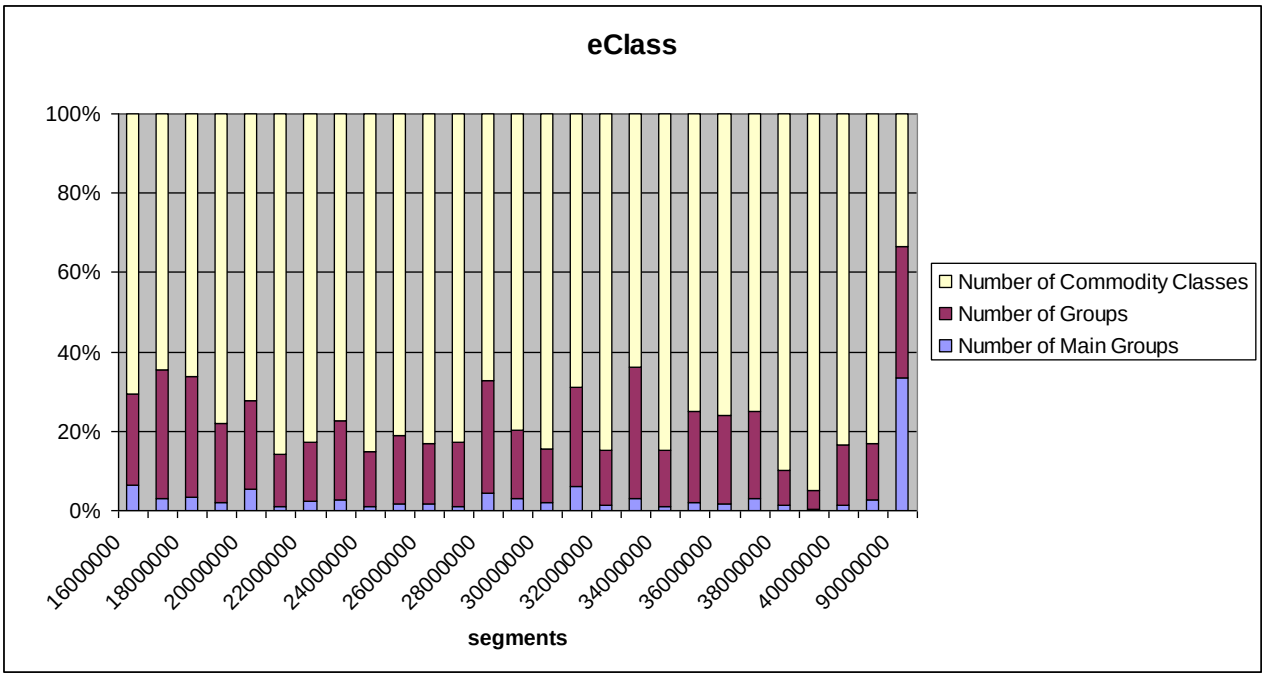


Figure 42 - eCl@ss – part 2

GPC Code	Title	Number of Nodes	Number of Families	Number of classes	Number of bricks
10000000	Pet Care/Food	42	3	8	31
47000000	Homecare	52	3	7	42
50000000	Food/Beverage/Tobacco	382	13	66	303
51000000	Healthcare	170	5	30	135
53000000	Beauty/Personal Care/Hygiene	154	6	19	129
54000000	Baby Care	61	3	7	51
58000000	Cross Segment	4	1	1	2
60000000	Textual/Printed/Reference Materials	16	1	4	11
61000000	Music	31	1	4	26
62000000	Stationery/Office Machinery/Occasion Supplies	129	3	15	111
63000000	Footwear	20	1	5	14
64000000	Personal Accessories	35	1	4	30
65000000	Computing	92	1	10	81
66000000	Communications	41	1	4	36
67000000	Clothing	58	1	9	48
68000000	Audio Visual/Photography	171	5	17	149
70000000	Arts/Crafts/Needlework	92	1	13	78
71000000	Sports Equipment	144	1	22	121
72000000	Home Appliances	129	2	13	114
73000000	Household Kitchen Merchandise	87	1	8	78
74000000	Camping	41	1	6	34
75000000	Household/Office Furniture/Furnishings	97	3	13	81
77000000	Automotive	306	1	40	265
78000000	Electrical Supplies	75	5	12	58
79000000	Plumbing/Heating/Ventilation/Air Conditioning	84	1	8	75
80000000	Tools/Equipment - Hand	123	1	23	99
81000000	Lawn/Garden Supplies	224	1	17	206

GPC Code	Title	Number of Nodes	Number of Families	Number of classes	Number of bricks
82000000	Tools/Equipment - Power	82	1	4	77
83000000	Building Products	252	1	22	229
84000000	Tool Storage/Workshop Aids	16	1	2	13
85000000	Safety/Protection - DIY	21	1	2	18
86000000	Toys/Games	86	1	12	73
87000000	Fuels	19	2	5	12
88000000	Lubricants	24	3	6	15
89000000	Live Animals	30	1	2	27
91000000	Safety/Security/Surveillance	65	4	10	51
	Total	3455	82	450	2923

Figure 43 - GPC – part 1

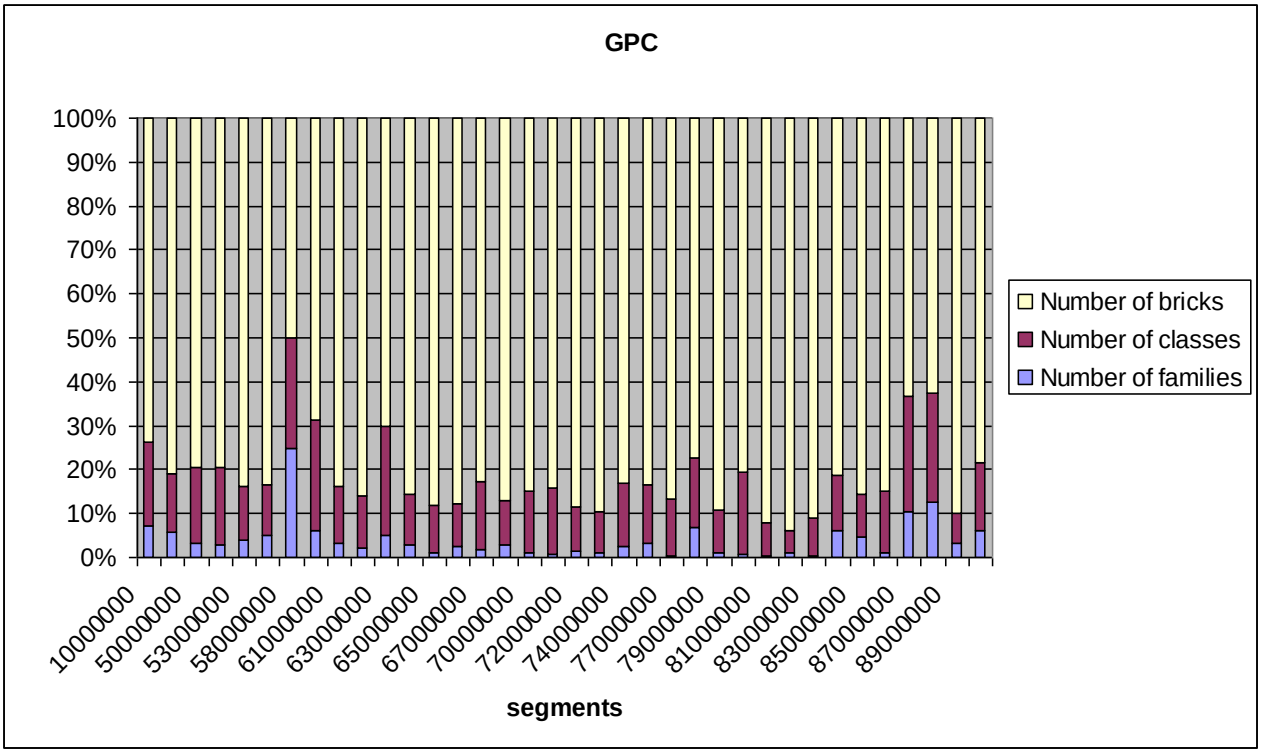


Figure 44 - GPC – part 2

UNSPSC Code	Title	Number of Nodes	Number of families	Number of classes	Number of commodities
10000000	Live Plant and Animal Material and Accessories and Supplies	283	9	37	236
11000000	Mineral and Textile and Inedible Plant and Animal Materials	347	10	40	296
12000000	Chemicals including Bio Chemicals and Gas Materials	442	7	57	377
13000000	Resin and Rosin and Rubber and Foam and Film and Elastomeric Materials	188	2	9	176
14000000	Paper Materials and Products	135	3	12	119
15000000	Fuels and Fuel Additives and Lubricants and Anti corrosive Materials	91	4	10	76
20000000	Mining and Well Drilling Machinery and	716	5	62	648

UNSPSC Code	Title	Number of Nodes	Number of families	Number of classes	Number of commodities
	Accessories				
21000000	Farming and Fishing and Forestry and Wildlife Machinery and Accessories	93	2	12	78
22000000	Building and Construction Machinery and Accessories	99	1	6	91
23000000	Industrial Manufacturing and Processing Machinery and Accessories	734	20	92	621
24000000	Material Handling and Conditioning and Storage Machinery and their Accessories and Supplies	319	5	30	283
25000000	Commercial and Military and Private Vehicles and their Accessories and Components	594	10	69	514
26000000	Power Generation and Distribution Machinery and Accessories	456	5	31	419
27000000	Tools and General Machinery	572	4	28	539
30000000	Structures and Building and Construction and Manufacturing Components and Supplies	927	15	87	824
31000000	Manufacturing Components and Supplies	2292	29	163	2099
32000000	Electronic Components and Supplies	262	6	18	237
39000000	Electrical Systems and Lighting and Components and Accessories and Supplies	483	4	29	449
40000000	Distribution and Conditioning Systems and Equipment and Components	466	4	24	437
41000000	Laboratory and Measuring and Observing and Testing Equipment	1439	3	106	1329
42000000	Medical Equipment and Accessories and Supplies	2667	21	241	2404
43000000	Information Technology Broadcasting and Telecommunications	621	5	48	567
44000000	Office Equipment and Accessories and Supplies	385	3	31	350
45000000	Printing and Photographic and Audio and Visual Equipment and Supplies	199	5	21	172
46000000	Defense and Law Enforcement and Security and Safety Equipment and Supplies	324	10	36	277
47000000	Cleaning Equipment and Supplies	200	4	16	179
48000000	Service Industry Machinery and Equipment and Supplies	178	3	15	159
49000000	Sports and Recreational Equipment and Supplies and Accessories	279	12	27	239
50000000	Food Beverage and Tobacco Products	17908	29	957	16921
51000000	Drugs and Pharmaceutical Products	1870	14	99	1756
52000000	Domestic Appliances and Supplies and Consumer Electronic Products	340	7	23	309
53000000	Apparel and Luggage and Personal Care Products	286	5	33	247
54000000	Timepieces and Jewelry and Gemstone Products	63	3	10	49
55000000	Published Products	124	3	8	112
56000000	Furniture and Furnishings	248	4	28	215
60000000	Musical Instruments and Games and Toys and Arts and Crafts and Educational Equipment and Materials and Accessories and Supplies	1265	5	109	1150
70000000	Farming and Fishing and Forestry and Wildlife Contracting Services	280	8	35	236
71000000	Mining and oil and gas services	529	7	48	473
72000000	Building and Facility Construction and Maintenance Services	418	5	51	361
73000000	Industrial Production and Manufacturing Services	322	9	34	278
76000000	Industrial Cleaning Services	91	4	18	68

UNSPSC Code	Title	Number of Nodes	Number of families	Number of classes	Number of commodities
77000000	Environmental Services	99	4	13	81
78000000	Transportation and Storage and Mail Services	119	6	23	76
80000000	Management and Business Professionals and Administrative Services	226	7	25	193
81000000	Engineering and Research and Technology Based Services	257	7	36	213
82000000	Editorial and Design and Graphic and Fine Art Services	199	6	23	169
83000000	Public Utilities and Public Sector Related Services	116	3	17	95
84000000	Financial and Insurance Services	118	5	20	92
85000000	Healthcare Services	201	8	26	166
86000000	Education and Training Services	124	5	20	98
90000000	Travel and Food and Lodging and Entertainment Services	99	6	24	68
91000000	Personal and Domestic Services	49	2	10	36
92000000	National Defense and Public Order and Security and Safety Services	113	3	18	91
93000000	Politics and Civic Affairs Services	286	8	30	247
94000000	Organizations and Clubs	127	4	18	104
	Total	41668	388	3113	38099

Figure 45 - UNSPSC – part 1

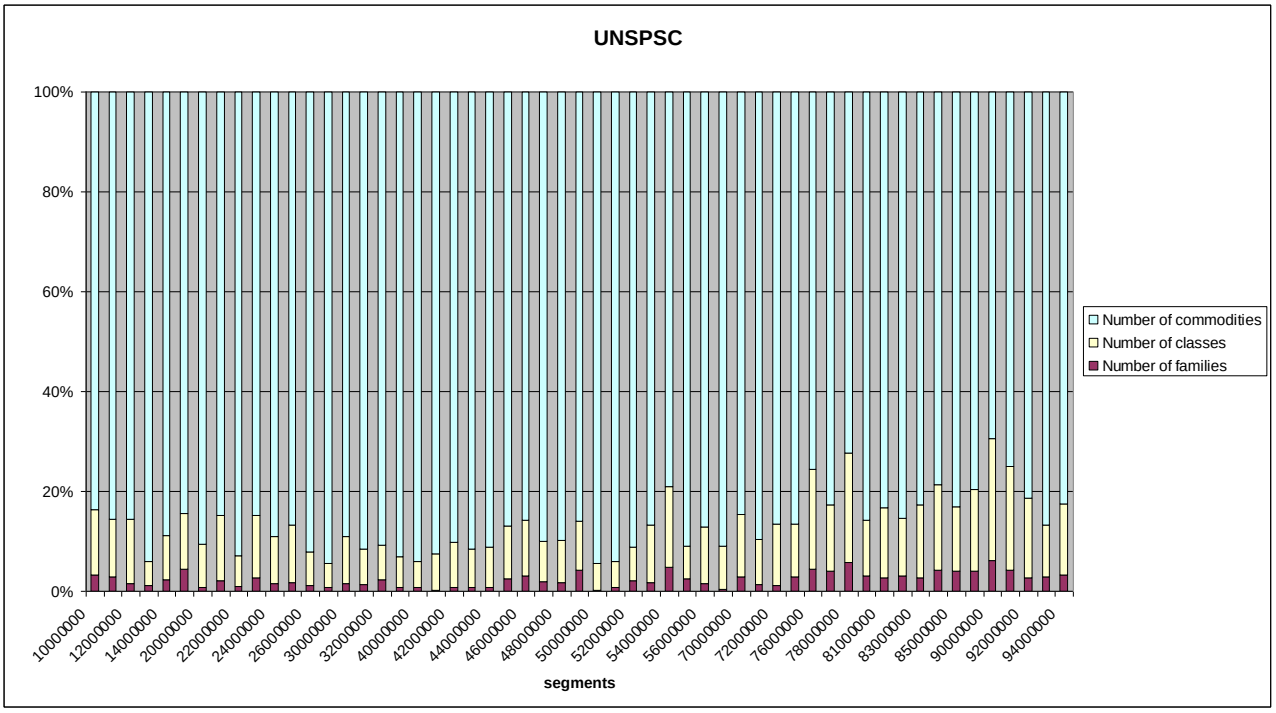


Figure 46 - UNSPSC – part 2

5.2.4 Phase 2: Syntactical Analysis

5.2.4.1 General

In the second phase of the analysis methodology, there will be a syntactical analysis comprising of two aspects:

- Numbering schemas of the classification systems
- Naming schemas of the classification systems

5.2.4.2 Numbering schemas

The investigation of the numbering schemas of the different classification systems lead to the **differences shown in figure 47.**

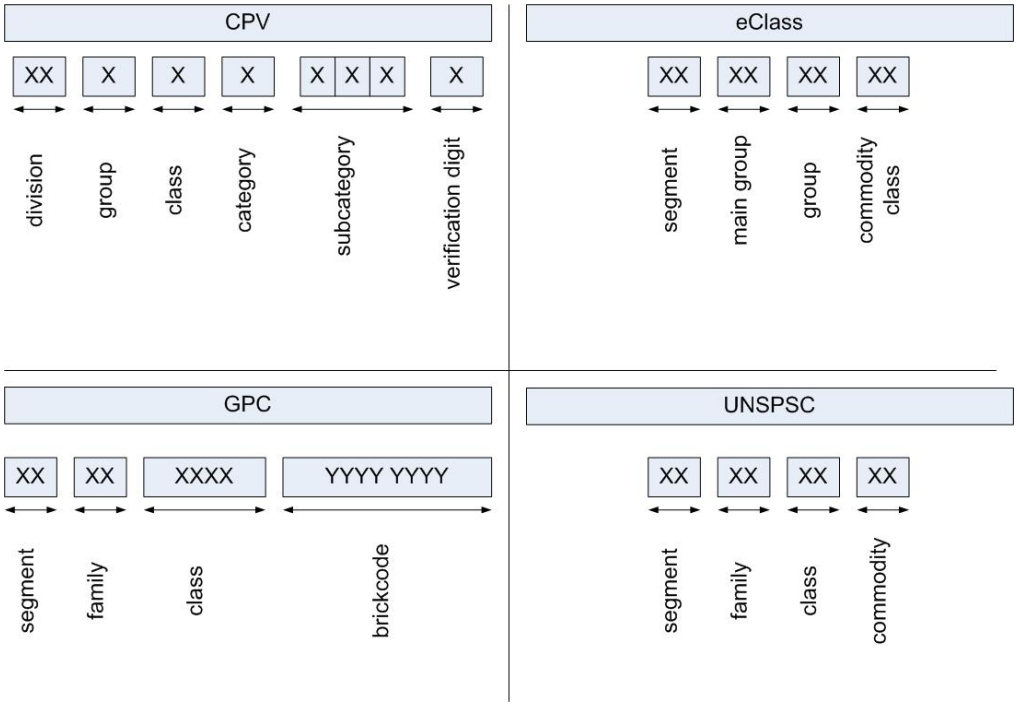


Figure 47 - Differences in numbering schemas of CPV, eCl@ss, GPC and UNSPSC

According to the CPV numbering schema it has to be taken into account that by using the 3 subcategory digits an implicit possibility is given to enhance the hierarchy levels of CPV. From a structural point of view given by the numbering schema, CPV deals with 5 hierarchy levels but these last 3 digits can be used to give a greater degree of precision within each category by reflecting hierarchy dependencies between commodity classes inside one category. So from a semantical point of view CPV can be seen as a 7-level classification system.

In case of GPC the lowest level in the hierarchy, Brick, has a level beneath it called Brick Attribute to which Brick Attribute Values are allocated. Brick Attributes or Values are not included in the hierarchy, as they cannot be aggregated to higher levels. Brick Attributes are only relevant to the Brick they are assigned to. Brick Attribute Values are only relevant to the Brick Attribute they are assigned to.

5.2.4.3 Naming schemas

Taking a deeper look at the naming schemas of the different classification systems shows that none of the classification systems are using a clear naming schema. Because of this no rules for naming of commodity classes can be given to an appropriate classification system. In the following the observations from control the naming schemas are given instead.

		CPV	eCl@ss	GPC	UNSPSC
First word of item in capital letter		X	X	X	X
First word of item in small letter			X		
Item consists of some words		X	X	X	X
	Separated by comma “,”	X	X		
	Separated by hyphen “-“	X	X	X	
	Separated by colon “:”	X			
	Separated by semicolon “;”	X			
	Separated by slash “/”			X	
Items are named in plural form		X	X	X	X
Items are named in singular form		X	X	X	X
Word in items are supplemented by					
	“(incl.. …)”	X			
	“(excl. …)”	X			
	“(except …)”	X			
	“(recommendation)”	X			
	“(additional info)”	X		X	
	“(abbreviation)”	X	X	X	
	“(…)”	X	X	X	
Item is named as sentence		X			
Item contains properties			X	X	X
Item contains information about application area			X	X	X

Figure 48 - Comparison of naming schemas for CPV, eCl@ss, GPC and UNSPSC

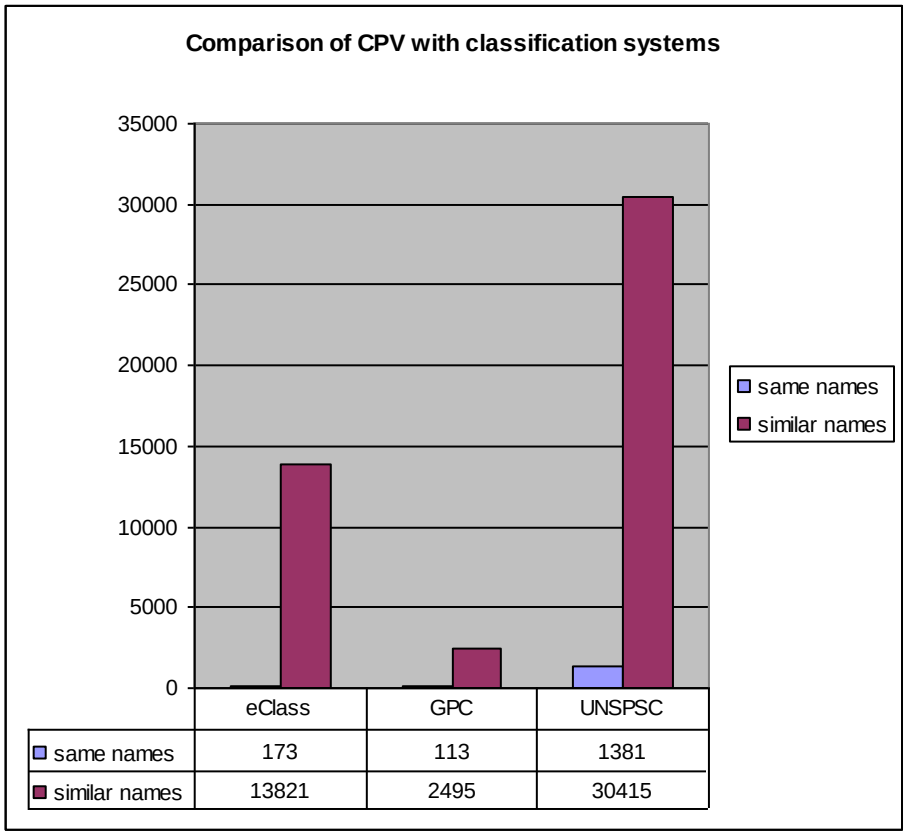
The comparison shows that almost everything which can be written in an item name is used in the different classification systems. Because of this a direct comparison of the commodity classes within the classification systems and a mapping between these classes is not feasible on name basis.

5.2.5 Phase 3: Semantic analysis – Detailed Analysis on class level

5.2.5.1 General

The phase of the semantic analysis is taking the numerical and syntactical analysis phases as a starting point. In the first step, a comparison has been done to get a rough overview about the overlapping of the classification systems in terms of commodity class names. For this, identical and similar commodity class names between the different classification systems have been investigated and the results are shown in the figures of this subsection below.

5.2.5.2 Comparison of CPV with the different classification systems



	eClass	GPC	UNSPSC
same names	173	113	1381
similar names	13821	2495	30415

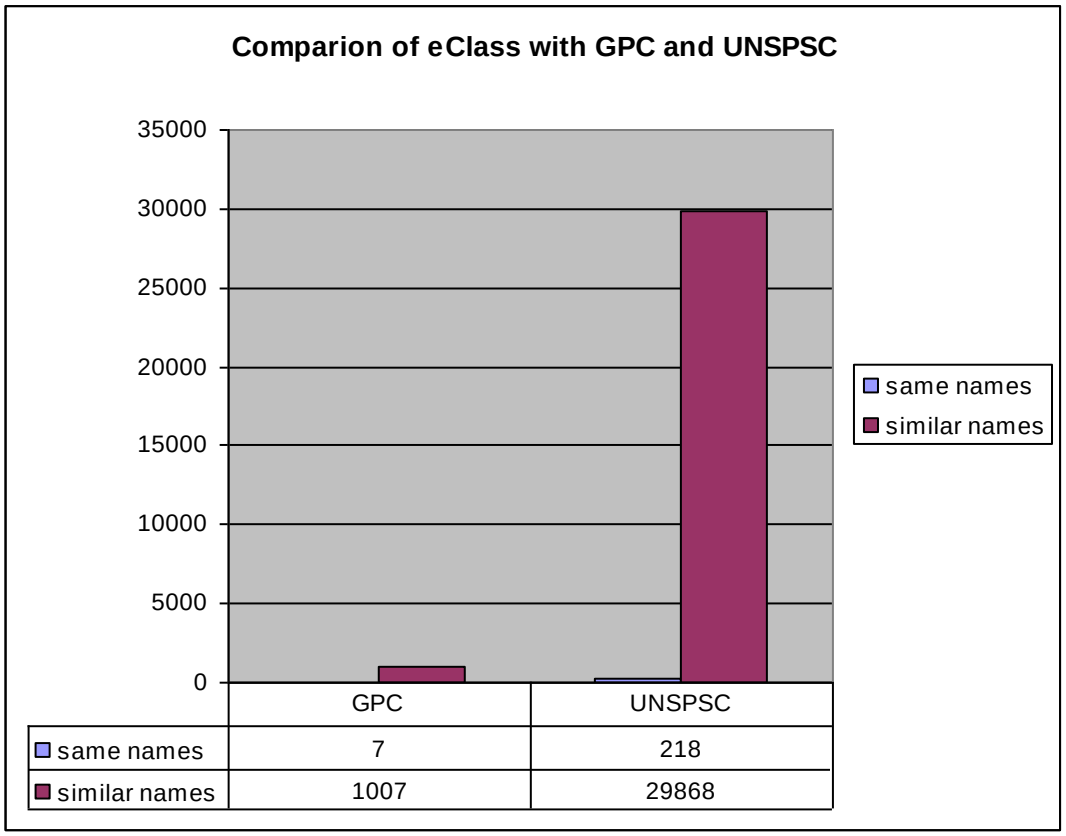
Figure 49 - Comparison of CPV with different classification systems

The comparison of CPV with the other investigated classification systems shows that in general there are some overlapping between some identical class names and that there are much more overlapping between similar class names.

The comparison shows the following overlapping:

- CPV commodity class names identical covering 5 % of eCl@ss class names.
- CPV commodity class names identical covering 1,2 % of the GPC class names.
- CPV commodity class names identical covering about 15 % of the UNSPSC class names.

In addition, there are some overlapping when investigating similarities in class names. Here is has to be taken into account that all nodes on all levels of the classification systems are included in the comparison. Because of this, analysis that is more detailed is necessary based on cleared class names and focused only on the 4th level of the classification system. This will be done until the final report.



	GPC	UNSPSC
same names	7	218
similar names	1007	29868

Figure 50- Comparison of eCl@ss with GPC and UNSPSC

The comparison of eCl@ss with GPC and UNSPSC shows that there are some overlappings between eCl@ss and UNSPSC and only a few overlappings in class names between eCl@ss and GPC.

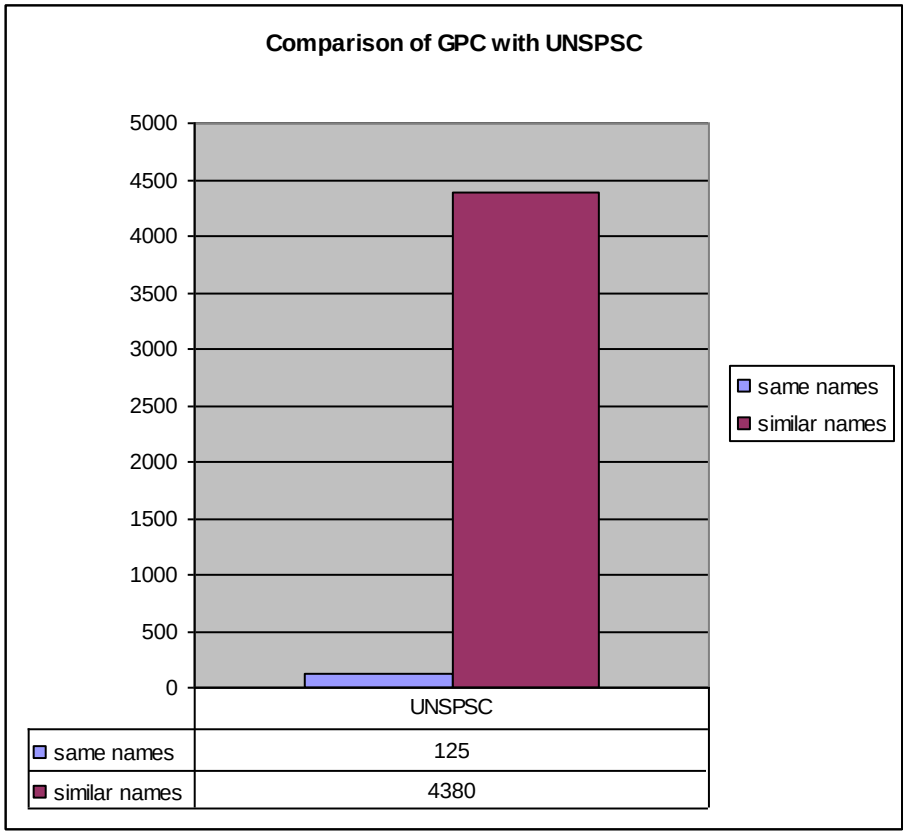


Figure 51 - Comparison of GPC with UNSPSC

The comparison of GPC and UNSPSC shows that according to identical class names there are only few overlapping but there are a lot of class names of UNSPSC similar to class names given by GPC. Nevertheless, much more investigation has to be undertaken to make a stable statement about the real overlapping degree of these both classification systems. This will be given within the final report.

5.2.6 Phase 4: Summary and recommendations

5.2.6.1 Summary

Within this report different approaches for analysis and comparison of the different classification systems have been followed. The analysis covers the numerical analysis, the analysis of the different numbering and naming schemas for the investigated classification systems and a comparison of the different classification systems according to identical or similar commodity class names.

The main results of the numerical analysis are:

- All classification systems have number of segments between 27 and 55.
- UNSPSC with 55 segments includes the biggest number of segments, whereas eCl@ss covering 27 segments.
- The volume of the classification systems according to the covered number of nodes (on all levels) differs from 3455 (GPC), 9454 (CPV), to 32592 (eCl@ss) and 41668 (UNSPSC).
- Also the comparison at class level shows that eCl@ss with 27053 commodity classes and UNSPSC with 38099 commodity classes are closely together. When looking at this numbers and the class names behind them it can be stated that eCl@ss covers a broader range of products since the number of commodity classes within UNSPSC is the result from putting attribute information into the class names. Because of this the number of commodity classes within UNSPSC raises up.

Figure 47 has shown the differences in the numbering schemas of the different classification systems. Although there are some differences, all classification systems are using a 4 to 5 level numbering schema.

Figure 48 has shown that CPV and GPC have the most variety in naming commodity classes. Almost all possible character combinations are used which leads to a very varying naming schema for these classification systems.

Figures 49 to 51 have shown that there are big overlappings based on similar commodity class names between CPV, eCl@ss and UNSPSC and eCl@ss and UNSPSC.

The third phase of the analysis has shown that the focus of the different classification systems in terms of application area is different and based on this the naming of classes and definition of attribute lists.

5.2.6.2 Recommendations

5.2.6.2.1 General

In this subsection recommendations are given firstly for all classification system standards and secondly for each classification standard.

5.2.6.2.2 Recommendations for all Standards

To harmonize the different classification system standards maintained by different authorities it is recommended to follow the following overall strategy. This strategy leads to a reduced number of classification systems and at least to a consistent development process between the different classification systems.
The ground for this overall strategy is the different classification systems in their current versions and their different maintenance processes. The mapping methodology pointed out in this report leads o a mapping between the different classification hierarchies of the classification systems. In addition, the recommendations extracted from the class level analysis leads to a harmonized representation of the class descriptions of the different classification systems. Both harmonized parts should be integrated into a database based on the Gen-ePDC data model, which is generated based on the ISO 13584 Standard. To keep the development of the different classification systems consistent, synchronization points between these maintenance processes shall synchronize the individual development processes.
This means that each change in a classification system should be taken into account and be sent to the related classification system agencies. The classification system agencies shall prepare synchronization points to discuss the propose changes and take it over into their own classification system or at least update the mapping with the changes. Properties shall be sent to the national or international authorities responsible for standardizing product properties and concept descriptions. These properties and concept descriptions shall be synchronized between the standards bodies and the classification authorities to reach product

descriptions based on standardized properties and concepts and to distribute the workload for maintaining these items between all authorities dealing with classification systems.

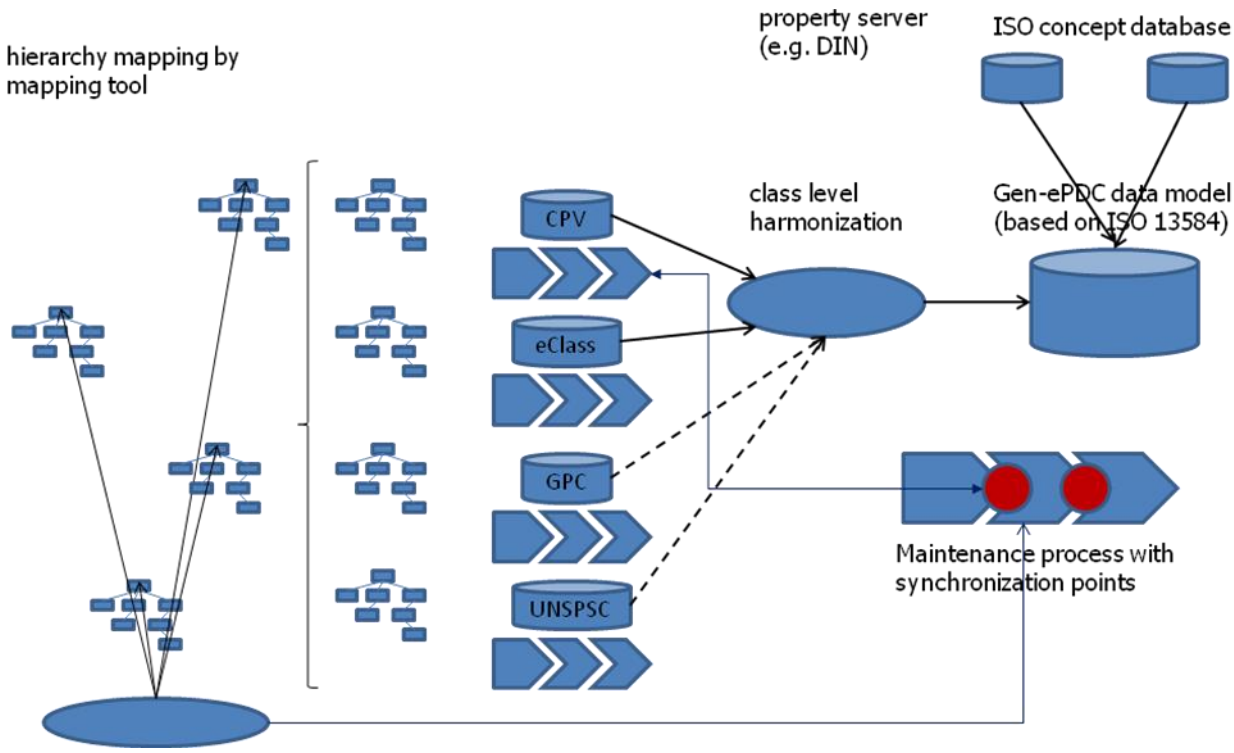


Figure 52 - Overall harmonization strategy

This figure leads to the following overall recommendations:

- Take the Gen-ePDC data models as the basis for the development and maintenance of classification systems
    - Adaptations to reach a synchronization between the different classification agencies are possible
- Take the Gen-ePDC maintenance process as a reference process for evolving and maintain a harmonized classification system by defining synchronization points between the different distributed classification processes
- The maintenance process shall be governed by one agency. A good starting point might be the combined maintenance of CPV and eCl@ss by one classification authority.
- Provide a mapping table for hierarchy synchronization for the different classification systems and maintain this table based on the synchronized maintenance process.
- Provide class level integration for product data synchronization as starting point
    - Take CPV classes as starting point
    - Enhance CPV classes by eCl@ss attribute lists and attributes
    - Enhance CPV by missing classes of eCl@ss
    - Use eCl@ss and/or standardized attributes for class description
    - Extend this combined classification system by GPC bricks and brick attributes
    - Extend this combined classification system by UNSPSC classes where necessary

The basis for the development of classification systems shall be the data model given by the Gen-ePDC project. This data model is based on the ISO pLib data model.

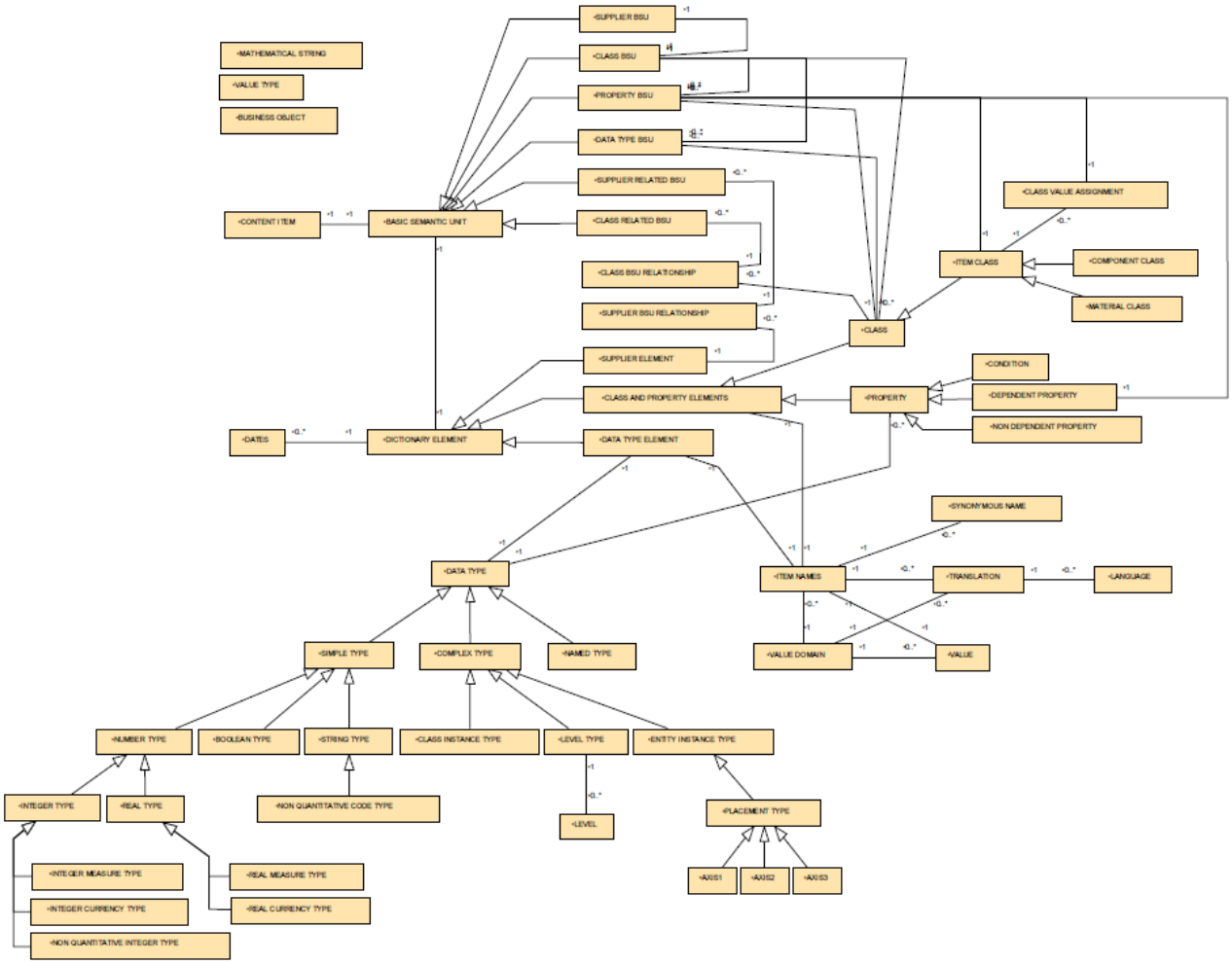


Figure 53 - Gen-ePDC data model for product classification systems

An example for this methodology to get a harmonized classification system based on the Gen-ePDC data model is given in the next figure. It has to be realized that in the following figure also numbering attributes are included as given by eCl@ss for identification purposes. These attributes are included in the harmonization on class level for compatibility reasons. According to UNSPSC, only mappable UNSPSC class names shall be taken over to the Synonyms where possible.

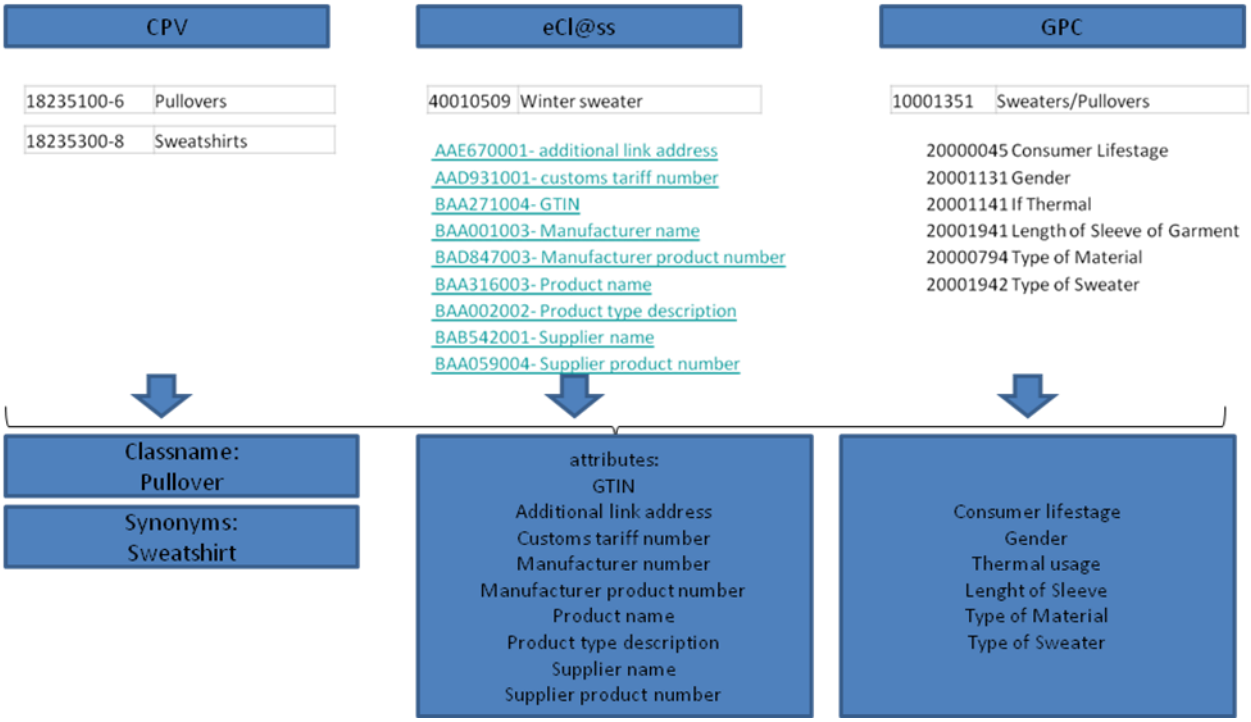


Figure 54 - Harmonization on class level

To support this methodology for harmonizing the different classification systems, the same approach is supported by the analysis methodology given inside this report for the class level analysis.

The recommendations below are starting with CPV, extended by recommendation for eCl@ss and completed by recommendations for GPC. UNSPSC can deliver useful synonyms for the harmonized classes but since UNSPSC has no attributes, it is not focuses by the harmonization process.

5.2.6.2.3 Recommendations for CPV

According to the analysis phase of 5.2.5 the following recommendations can be given for CPV:

1. Looking for a maintenance authority or agency for the consolidated and synchronized development of CPV.
2. Definition of an efficient maintenance process with synchronization points to the relevant classification system authorities, at least eCl@ss and GPC.
3. Clearance of names for the naming of classes by considering the naming inconsistencies given in 5.2.4 and keeping consistency to eCl@ss and GPC.
4. Taking in as change requests the missing classes from eCl@ss, GPC and UNSPSC if necessary and used.
5. Taking in as change requests the missing attributes from eCl@ss and GPC for needed and useful classes in CPV.
6. Establishment of synchronization points to national and international standardization bodies for attribute and concept standards, e.g. DIN for Germany and ISO for concept database.
7. Introduction of functional or application oriented attribute lists for classes to generate different views on classes.
8. Establishment of maintenance database according to the Gen-ePDC data model based on ISO 13584.

5.2.6.2.4 Recommendations for eCl@ss

According to the analysis phase of 5.2.5 the following recommendations can be given for eCl@ss:

1. Establishment of a maintenance database according to the Gen-ePDC data model based on ISO 13584.
2. Definition or extension of an efficient maintenance process with synchronization points to CPV and GPC and possibly UNSPSC.
3. Clearance of names for the naming of classes by considering the naming inconsistencies given in subsection 5.2.4 and keeping consistency to CPV and GPC.
4. Taking in as change requests the missing classes from CPV, GPC and UNSPSC if necessary and used.
5. Taking in as change requests the missing attributes from GPC and supplementary codes from CPV for needed and useful classes in eCl@ss..
6. Establishment of synchronization points to national and international standardization bodies for attribute and concept standards, e.g. DIN for Germany and ISO for concept database for clearance and standardization of eCl@ss attributes.
7. Introduction of functional or application oriented attribute lists for classes to generate different views on classes.

5.2.6.2.5 Recommendations for GPC

According to the analysis phase of 5.2.5 the following recommendations can be given for eCl@ss:

1. Establishment of a maintenance database according to the Gen-ePDC data model based on ISO 13584.
2. Definition or extension of an efficient maintenance process with synchronization points to CPV and eCl@ss and possibly UNSPSC.
3. Clearance of names for the naming of classes by considering the naming inconsistencies given in subsection 5.2.4 and keeping consistency to CPV and GPC.
4. Taking over as change requests the missing classes from CPV, eCl@ss and UNSPSC if necessary and used.
5. Taking over as change requests the missing attributes from eCl@ss and supplementary codes from CPV for needed and useful classes in eCl@ss..
6. Establishment of synchronization points to national and international standardization bodies for attribute and concept standards, e.g. DIN for Germany and ISO for concept database for clearance and standardization of GPC attributes.

5.3 Introduction of functional or application oriented attribute lists for classes to generate different views on classes

Mapping exercise results and benefits

5.3.1 General

Based upon the conducted mapping exercise some intersection points among the four classification systems could be found.

5.3.2 Main findings

5.3.2.1 General

The following version has been used to map the classification systems: CPV 2008, eCl@ss 6.0.1, GPC “As at 31 August 2009”, UNSPSC v11.1201.

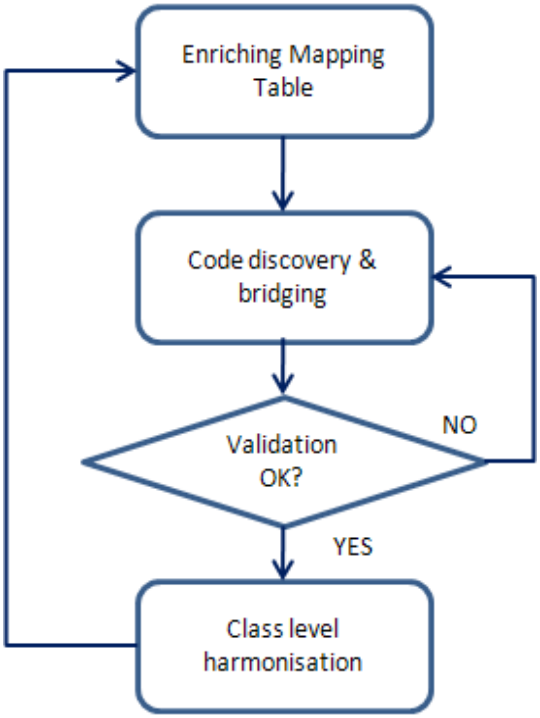
In order to align with the comparison work conducted by the other experts as detailed in section 5.1 and 5.2, the mapping exercise was done on six categories: clothing, food, furniture, electronics, laboratory and energy.

The work has consisted of five steps.
In the first step, the two existing mapping tables (GPC - UNSPSC and eCl@ss - UNSPSC) were updated to the latest versions.
The second step, the new mappings between GPC and CPV and eCl@ss and CPV (in both directions) were set.
In the third step, the mapping between UNSPSC and CPV in both directions was made.
In the fourth step, eCl@ss and CPV were mapped in both directions.
In the fifth step, consolidation took place by following the CPV coding sequence.

The mapping tables for clothing is provided as an annex.

5.3.2.2 Mapping approach

The mapping construct is done iteratively - as described in the flowchart below to provide a solid basis for the actionable options (specified in 5.3.3 Potential Implementation Alternatives).



Enriching Mapping Table: given the wide variety of terms, attributes and properties across the classification systems there was a need for a way to accommodate all of the differences.
Code discovery and bridging is required to establish logical and semantic relationships

Fully automated alignment approaches are not realistic since the differences between classification systems are not as simple as the equivalence or subclass relations between named classes typically found by such systems. Even terms with identical names are often semantically different. For this reason, our alignment was mainly a manual process that involved looking at names and structures, and when possible we used definitions, synonyms and actual product descriptions.

The mapping was conducted rather manually with the help of some semi-automatic search and browse features and automated data extraction of the MS Excel tables and associated documents. The GS1 and Ifcc mapping tools were also used.

Although one to one mapping is the most desirable matching, it is difficult to find it. Classification nodes that appear at one level in one classification frequently appear at different levels in the other classification systems.

The identified mapping relationships are as follows:

Table 9 - Type of mapping relationships

121	One to One
12M	One to Many
M21	Many to One
M2M	Many to Many
N21	None to One
12N	One to None
N2N	None to None
N2M	None to Many
M2N	Many to None

One to One: One Class in one system is bridged with an equivalent Class of the other system
One to Many: One Class in one system is bridged with more than one Class of the other system
Many to One: Several Classes in one system is bridged with one Class of the other system
Many to Many: Several Classes in one system is bridged with more than one Class of the other system
NO MAPS
None to One: Class is missing in one system but there is One Class in the other system
One to None: One Class is available in one system but there is no equivalent Class in the other system
None to None: Classes are missing in both systems but there are Classes available at one of the / at both of the other two systems
None to Many: A Class is missing in one system but there are Classes available at one of the / at both of the other two systems
Many to None: Several Classes are available in one system but there is no equivalent Class in the other system

In the following tables, statistics of the mapping options for the clothing domain are shown.

Table 10 - Mapping relationships for the clothing domain from CPV to the other three systems

		To eCl@ss	To GPC	To UNSPSC
121	One to One	26	79	40
12M	One to Many	33	15	50
M21	Many to One	2	4	7
M2M	Many to Many	4	7	5
N21	None to One	34	74	116
12N	One to None	66	31	35
N2N	None to None	110	70	32
N2M	None to Many	37	37	32
M2N	Many to None	5	0	0
	TOTAL	317	317	317

Table 11 - Mapping relationships for the clothing domain from eCl@ss to the other three systems

		To CPV	To GPC	To UNSPSC
121	One to One	26	49	35
12M	One to Many	2	2	18
M21	Many to One	33	50	26
M2M	Many to Many	4	14	42
N21	None to One	66	86	102
12N	One to None	34	8	9
N2N	None to None	110	82	51
N2M	None to Many	5	15	28
M2N	Many to None	37	11	6
	TOTAL	317	317	317

- **From GPC to the other three systems**

Table 12 - Mapping relationships for the clothing domain from GPC to the other three systems

		To CPV	To eclass	To UNSPSC
121	One to One	79	49	98
12M	One to Many	4	50	49
M21	Many to One	15	2	3
M2M	Many to Many	7	14	19
N21	None to One	31	8	73
12N	One to None	74	86	46
N2N	None to None	70	82	19
N2M	None to Many	0	11	8
M2N	Many to None	37	15	2
	TOTAL	317	317	317

Table 13 - Mapping relationships for the clothing domain from UNSPSC to the other three systems

		To CPV	To eclass	To GPC
121	One to One	40	35	98
12M	One to Many	7	26	3
M21	Many to One	50	18	49
M2M	Many to Many	5	42	19
N21	None to One	35	9	46
12N	One to None	116	102	73
N2N	None to None	32	51	19
N2M	None to Many	0	6	2
M2N	Many to None	32	28	8
	TOTAL	317	317	317

The potential reasonable relationships to search for “best available match” through multiple edges have been analysed. The original CPV hierarchical structure has been kept as much as possible.

Class level harmonization is the process of aligning the classes and properties of all the four classification systems.
The entire classification systems were used to find the equivalent codes for each mapping since the scope was somewhat different among those four systems. For example the scope of the Clothing category in CPV is spreading over in several segments in other systems as follows: (the two digit numbers are referring to the first two digits of the Segment codes in each system):

- eCl@ss – 6 Segments (20 Packing Material; 24 Office products, facilities and technics, papeterie; 30 Auxiliary supply, additive, cleaning agent; 34 Medicine, medical technology, life science; 40 Occupational safety, accident prevention; 41 Marketing)

- GPC – 9 Segments (67 Clothing; 63 Footwear; 54 Baby Care; 53 Beauty / Personal Care / Hygiene; 70 Arts / Crafts / Needlework; 64 Personal Accessories; 85 Safety Protection; 91 Safety / Security / Surveillance; 71 Sports Equipment)

- UNSPSC – 6 Segments (24 Material Handling and Conditioning and Storage Machinery and their Accessories and Supplies; 42 Medical Equipment and Accessories and Supplies; 46 Defense and Law Enforcement and Security and Safety Equipment and Supplies; 49 Sports and Recreational Equipment and Supplies and Accessories; 53 Apparel and Luggage and Personal Care Products; 54 Timepieces and Jewelry and Gemstone Products)

5.3.2.3 Mapping challenges

In the course of the mapping exercise, the project listed the following challenges.

The lack of mutual exclusivity i.e. a product has more than one classification code is a serious challenge.

The number of class level nodes among the six categories even under the same maintenance body are not identical – e.g.: at UNSPSC in the Food category there is a huge proliferation of the commodity codes

There are no definitions and properties (especially in UNSPSC and somewhat in CPV). However eCl@ss has properties but less definition of classes.

Different terminology due to different English versions (CPV and GPC are UK English; UNSPSC is American English while eCl@ss is translated from German to UK English).

GPC’s system logic is using property – property value pairs to find the equivalent GPC codes.

CPV hierarchy is not crystal clear – ‘Classes’ can be at different hierarchy level.

Timing: – extremely slow mapping process to achieve a comprehensive map cross-referencing all the four classification systems. For one category it roughly takes 5-10 man days to accomplish the full harmonisation except for the food domain for which twice as many man days are needed.

5.3.3 Potential implementation alternatives

5.3.3.1 General

For the relationship between CPV and the three commercial systems there are four recommended options for the CPV with the intention of obtaining an aligned strategy solution.

5.3.3.2 Option 1: Enhance the CPV classification with the help of the other three classifications

5.3.3.2.1 Process

The process is a four-step process:

1. Establish intersection points - mapping between CPV and the three commercial systems in all current divisions and beyond as needed;
2. Make changes in the CPV (including the hierarchy) to accommodate new codes;
3. Integrate the new codes;
4. Maintain governance and control of CPV classification.

5.3.3.2.2 Strengths

This solution has many advantages:

- The enhanced code set could improve the procurement processes;
- CPV maintains ownership, governance and control meeting the objectives of its user community;
- New divisions are created.

5.3.3.2.3 Weaknesses

With this solution, it is a difficult to maintain the alignment.

5.3.3.2.4 Conclusion

This solution is feasible and recommended.

5.3.3.3 Option 2: Create a ‘super classification’ by harmonising all the four classifications

5.3.3.3.1 Process

In this solution, the steps are the following:

1. Establish intersection points - mapping between CPV and the three commercial systems in all current divisions and beyond as needed;
2. Use the mapping to merge the classifications to form a super classification (CPV + eCl@ss + UNSPSC + GPC);
3. Consider a data model upgrade to be aligned with the relevant ISO standard(s);
4. Align governance and change management;
5. Develop properties to super classification;
6. Maintain the super classification.

5.3.3.3.2 Strengths

This solution would provide the strengths that are listed below:

- Provides a singular harmonised view, no need to maintain four separate classifications;
- Public and private procurement processes could be aligned;

- Users have no need to translate between classification, processes are eliminated;
- Cost effective synergies in a longer term.

5.3.3.3.3 Weaknesses

The following weaknesses would be anticipated:

- Governance conflicts, escalation and appeal routes must be resolved;
- Issues of ownership, funding and hosting;
- Issues of integration and frequency for change management and publication;
- Issues of communication both internal and external;
- Change request management systems.

5.3.3.3.4 Conclusion

This solution is gradually feasible, however maintaining may be difficult.

5.3.3.4 Option 3: Create a widely-available mapping and continue to maintain separate classifications

5.3.3.4.1 Process

The three steps of this solution are:

1. Establish intersection points - mapping between CPV and the three commercial systems in all current divisions and beyond as needed;
2. Make the mapping widely available for users;
3. Maintain the mapping ongoing.

5.3.3.4.2 Strengths

This solution:

- Acknowledges different business needs being met;
- Enables translations between classifications to meet the business need.

5.3.3.4.3 Weaknesses

- Governance conflicts, escalation and appeal routes must be resolved;
- Issues of ownership, funding and hosting;
- Expensive to set up and maintain;
- Not a single source of information, another process for users to implement;
- Mapping maintenance is complex and difficult;
- Time lag between versions of the classifications and the mapping.

5.3.3.4.4 Conclusion

This solution is feasible but may not be optimal.

5.3.3.5 Option 4: ‘Common Class’ Concept

5.3.3.5.1 Process

The six-step process is as follows:

1. Establish intersection points - mapping between CPV and the three commercial systems in all current divisions and beyond as needed;
2. Identify ‘Common Class’ to be shareable at the lowest level of the hierarchy by all the four classifications while the hierarchies could be different;

3. Make the ‘Common Class’ available for other systems to incorporate it;
4. Accommodate the ‘Common Class’ into each system separately but simultaneously;
5. Maintain the ‘Common Class’ ongoing by a 3rd party;
6. Incorporate ‘Common Class’ ongoing by CPV.

5.3.3.5.2 Strengths

- ‘Common Class’ is owned by the user community and shared by CPV and the other three commercial systems;
- This solution is relatively simple;
- Acknowledges different business needs being met – same ‘Common Class’ to be shared by several different hierarchies;
- Enables translations between classifications to meet the business need;
- ‘Common Class’ is used in all systems – identical component, there is no further mapping required.

5.3.3.5.3 Weaknesses

- Governance conflicts, escalation and appeal routes must be resolved;
- Additional workload at the beginning;
- Time lag between versions of the classifications and the mapping.

5.3.3.5.4 Conclusion

This solution is feasible and recommended.

6 Classification and ebusiness

6.1 Why using classifications

6.1.1 The value chain and the value system

The value chain is a series of value-generating activities within the business system.

The value chain logically presents the main functional areas ('value activities') of a company and differentiates between Primary activities and Support activities.
The goal of these activities is to offer the customer a level of value that exceeds the costs of the activities, thereby resulting in a profit margin.

The value chain primary activities are:

1. DELIVER Inbound: the activities of receiving and storing raw materials, components and parts, and their distribution to production (MAKE operations) when and as required;

2. MAKE Operations: the processes of transforming raw materials, components and parts into finished products and services;

3. DELIVER Outbound; the storage and distribution of finished goods;

4. Marketing & Sales; the identification of customer needs and the generation of sales;

5. SERVICE; the support of customers after the products and services are sold to them;

6. RETURN: the transformation of products which are not usable anymore.

The primary activities are facilitated by support activities. Those are

I. Firm Infrastructure (general management, planning, finance, accounting, legal, government affairs, quality management, ICT)

II. Human Resource Management

III. Technology Development (R&D, Engineering, Product and Process Design))

IV. Procurement (Sourcing, Purchasing, Supplier Management)

Primary and support activities are shown in Figure 55.

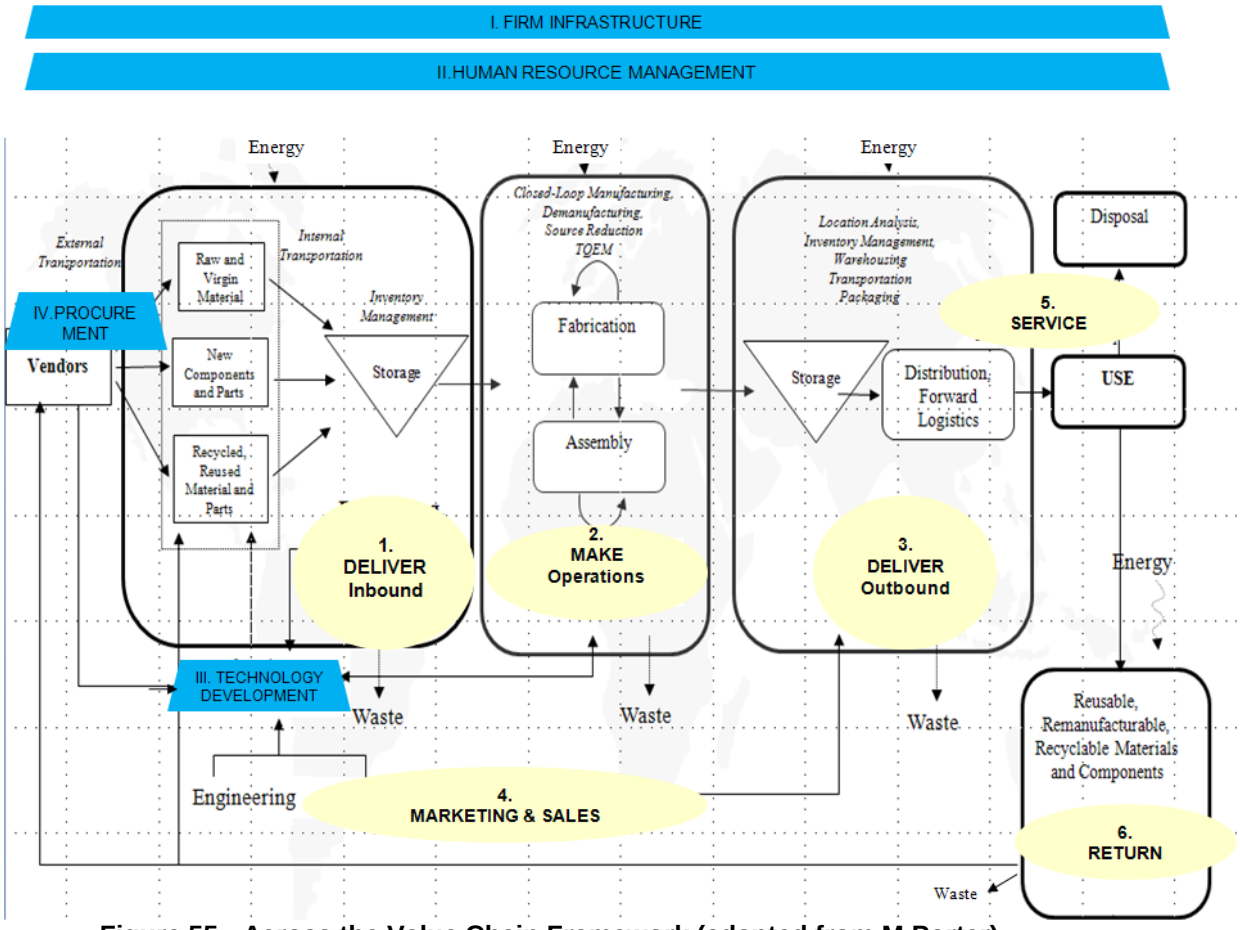


Figure 55 - Across the Value Chain Framework (adapted from M.Porter)

However, these activities are "not a collection of independent activities but a system of interdependent activities", which are "related by linkages within the value chain". These linkages can lead to competitive advantage through optimisation and coordination and infrastructure is required to make these linkages fully operational. In this context, product classifications are key enablers.

Moreover, the "value system" expands the value chain concept by extending the perspective beyond the single company. The firm's value chain is linked to the value chains of (upstream) suppliers and (downstream) buyers, resulting in a larger set of processes – the value system. All e-commerce and therefore electronic transactions occur within this value system.

Source: The European e-Business Report 2008

Standard product classifications, such as the four classifications studied in this CWA, have a key role to play in the value system and the value chain. This role is explained in the next section.

6.1.2 Benefits of use of classifications for companies

6.1.2.1 Benefits in the value chain

6.1.2.1.1 Control and Uniformity across the organisation – enabling corporate taxonomy

The usage of one standard classification system across the company ties together all departments and divisions including business functions such as sourcing, procurement, settlement, marketing, sales, accounting etc. Reporting that cross all product silos is facilitated. Also a single uniform view of all expenditures in a company is easily available.

6.1.2.1.2 Other potential users such as software and solution companies

Product classification enables many functions that enable to speed up the classification process for the following codes and numbers:

- Import control classification numbers
- Export control classification numbers
- Commodity / Class / Brick codes
- Tariff code numbers
- Common Agricultural Policy (CAP) numbers

6.1.2.1.3 Sourcing

6.1.2.1.3.1 Strategic Sourcing

Strategic sourcing is a process that continuously defines how, where and from whom the right product, or service, can be obtained. To support it, companies adopt spend analysis, the process of collecting, cleansing, classifying and analyzing expenditure data with the purpose of reducing procurement costs, improving efficiency and monitoring compliance. Beyond sourcing, spend analysis can be used for category management, inventory management, budgeting, planning, and product development. In this context, standard classifications are very important since they provide a search key to find and process information about products on the market. The different activities that are enabled by the classifications are:

- Finding and purchasing – product and service convention
- Data collection
- Opportunity Assessment
- E-RFX and Supplier Management
- Bid Collection and Negotiation
- Category level info to support procurement by measuring Sourcing Value
    - Price Per Unit (PPU)
    - Total Cost of Acquisition (TCA)
    - Total Cost of Ownership (TCO)
    - Total Value Management (TVM)
- Decision optimisation

6.1.2.1.3.2 Public and private eProcurement

E-procurement is using electronic exchanges to operate the transactional aspects of requisitioning, authorising, ordering, receipting and payment processes for the required products or services. In these processes, product classifications are used in different ways: In the public sector, they are:

- primarily instruments for tendering processes and inter-organizational spend analysis whereas in the private
- e-Procurement product classification refers to e-Ordering processes and e-Catalogues and intra-organizational procurement optimization

- The contributions to eProcurement of the classifications can be listed as follows;
    - Search support (hierarchical; key word; property-based)
    - Product specification
    - Product comparison
    - Spend analysis

6.1.2.1.4 Technology Development

A good coding and classification system provides design engineering with a system that facilitates:

- efficient retrieval of similar parts; development of a database containing effective product design data;
- standardization of design; prevention of design duplication; forming of part families;

use of producibility tips; and incorporation of engineering design changes into the engineering and manufacturing systems.

6.1.2.1.5 MAKE - Manufacturing

A single product could be modified several times within a project. So it is crucial that this will be done efficiently and in a standardised manner. The function to search select, copy and order quickly has to be provided. It is a must to use a classified, central product file for it.

Classification of engineering parts is a very demanding activity especially in process planning. It is one of the important methods utilised in the group technology approach to computer aided process planning.

A good coding and classification system provides the manufacturing process with a system that facilitates:

- the development of a Computer Aided Process Planning (CAPP) system;
- the retrieval of process plans for part families;
- the development of standard routings for part families;
- the development of machining cells.

Standard routings facilitate the development of tooling groups, NC program groups and standard setups for part families.

Production planning and control can be simplified: it can be more comprehensive.

Production scheduling can also be simplified.

Machining cells can reduce in-process inventory, resulting in shorter queues and shorter manufacturing throughput times.

Improved machine utilization yields shorter setup times and better scheduling.

Part family data facilitates improving plant layout, which in turn can reduce materials handling costs.

Dynamic classification should be used to categorize product properties according to the actual demand.

6.1.2.1.6 MARKETING AND SALES

6.1.2.1.6.1 Marketing analytical Device

Product classifications are useful for this primary activity since they are used to assist in planning marketing strategy and programs. A basic assumption is that products with common attributes such as end use or market and degree of processing or physical transformation can be marketed in a similar fashion. Product classifications also help to develop the appropriate marketing mix and market research data could be consolidated based on common codes. They also support market segmentation.

6.1.2.1.6.2 Merchandising support

Merchandising hierarchies contain product categories. Product classifications provide codes to identify these categories.

6.1.2.1.6.3 Web Shop

Product classifications are used in web shops to search products requested by end consumers.

6.1.2.1.6.4 Category Management

Product classifications are necessary to perform product and product category discovery – relevance and retrieval improvement. With the classification codes, IT systems can list similar products under a single category. It is also possible to group products with category specific product group attributes in catalogues allowing global SKU (Stock Keeping Unit) mix. A globally standardised positioning of products is feasible.

6.1.2.1.7 SERVICE

To control costs, stocks and service levels effectively there is much information to collate at category / class level based upon product classification such as ABC Analysis or the 80/20 rule and inventory costs.

6.1.2.2 Benefits in the value system

6.1.2.2.1 General

As defined ABOVE, the value system is the link of the value chains of (upstream) suppliers and (downstream) buyers with the company's own value chain, resulting in a larger set of processes. All e-commerce and therefore electronic transactions occur within this value system.

6.1.2.2.2 Catalogue support

A catalogue solution is a component of a complete e-procurement system. In B2B electronic product catalogues are a prerequisite. They contain essential information about the individual products such as descriptions, pricing, volume discounts, availability or images. If the product information for the goods to be acquired is not available in electronic form, an e-procurement system will not function.

The product catalogues of the manufacturers have to be fed into the purchasing organization's procurement systems directly.

A catalogue platform is a software solution that supports the required workflows both across departments and companies. For the supplier, these workflows include catalogue generation; for the buyer, verification of the catalogue and additional processing to convert them into company-specific procurement catalogues.

6.1.2.2.3 eCatalogue related processes

When electronic catalogues are involved, there is a need to synchronise information between the business partners systems. Product classifications are used in this synchronisation effort. They also enable the granularity and aggregation internally within a company and between trading partners and simplify the matching of the publication data with the subscription data. They also accelerate the introduction of new products by denoting what type of product they are.

6.1.2.2.4 All externally facing communication

Apart from ecatalogues, product classifications are used in many exchanges with trading partners for example, Product specifications; Price lists; Point of Sale (POS) Data; Joint Business Plans.

6.1.3 How to choose the right code in a classification

All the classification systems of the study have a hierarchical approach, even if for some of them the structure is not purely hierarchical.

Users have to go down the hierarchy from the first level down to the product level. It might occur that a satisfactory code is not (yet) assigned, then code 99999999 (Temporary Classification) from GPC or 90-90-90-90 (Interim class, unclassified) from eCl@ss are to be used.

When the name and definition of the code match the requirements, then the code is selected.

Keywords are also available in eCl@ss to make the search easier. CPV recommends using the search function of spreadsheet software to find the relevant codes.

For classifications that comprise attributes, attributes and their values are selected after the classification code has been chosen.

6.1.4 Recommendations on the mapping in ecatalogues

The product classification systems of the study are standard classifications that are intended to be used for external communication with trading partners. Because of the role they play in the interface with other organisations, these classifications are developed, maintained and published following a set of rules and constraints that usually do not exactly match companies' internal needs. Therefore an internal proprietary classification system is also applied in companies and populated in ecatalogues. Both codes are inserted into ecatalogues and maintained.

When two standard classifications are required by trading practices, there are two options: both codes are populated in the ecatalogues or automatic mapping is provided by the ecatalogue. In the latter situation, the code that is the ecatalogue is mapped automatically by the software to the other classification. This architecture is displayed in figure 56.

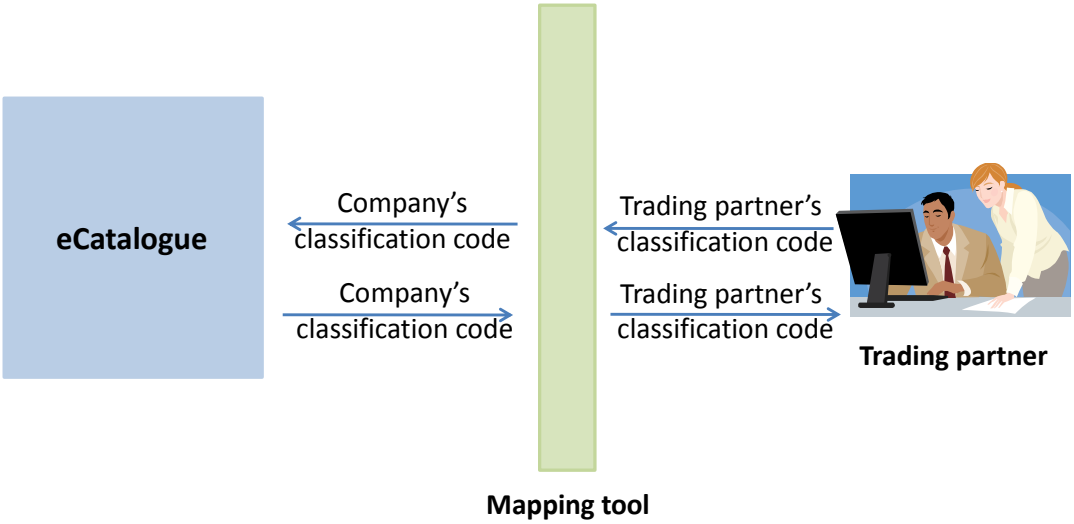


Figure 56 - Conversion between internal code and classification code.

6.2 Mapping tools

6.2.1 Current situation

At the moment multiple classification systems for classifying master data or product information are offered. The aim of these classification systems is to reduce transaction costs, to realize cost effects within Purchasing and a better presentation of the products in catalogues.

Out of various classification systems in this CC3P project four systems are analyzed:

- eCl@ss
- CPV
- GPC
- UNSPSC

The idea of mapping classification systems with each other like a converter is available since the existence of marketplaces. In the years between 2000 and 2005 there were many attempts to develop those kinds of converters – also named mapping tools.

Parallel to this development many initiatives were started to classify product information automatically. Tools which are used for classifying product data are as well called mapping tools.

Due to this development we have to differentiate between category “a” tools - mapping tools to map one classification system to another classification system - and category “b” tools - mapping tools to map product information to a classification system.

The situation on the market shows, that the progress of category “a” is in relation to category “b” tools very low. The progress of category “b” tools for standardized product information is therefore very high.

These results can be explained as follows: only by an intensive analysis of the respective classifications it turns out that there is an underlying different approach about the definition of object groups and therefore methodologically the groups can strongly differ from each other.

Sometimes these classifications have a strong "derivative character". This means that they are influenced by other classifications, but they also have different interests. A good example of methodological stringency is the "International Family of Economic and Social Classification" meaning the harmonized classification systems. See Figure 57 about the harmonized systems.

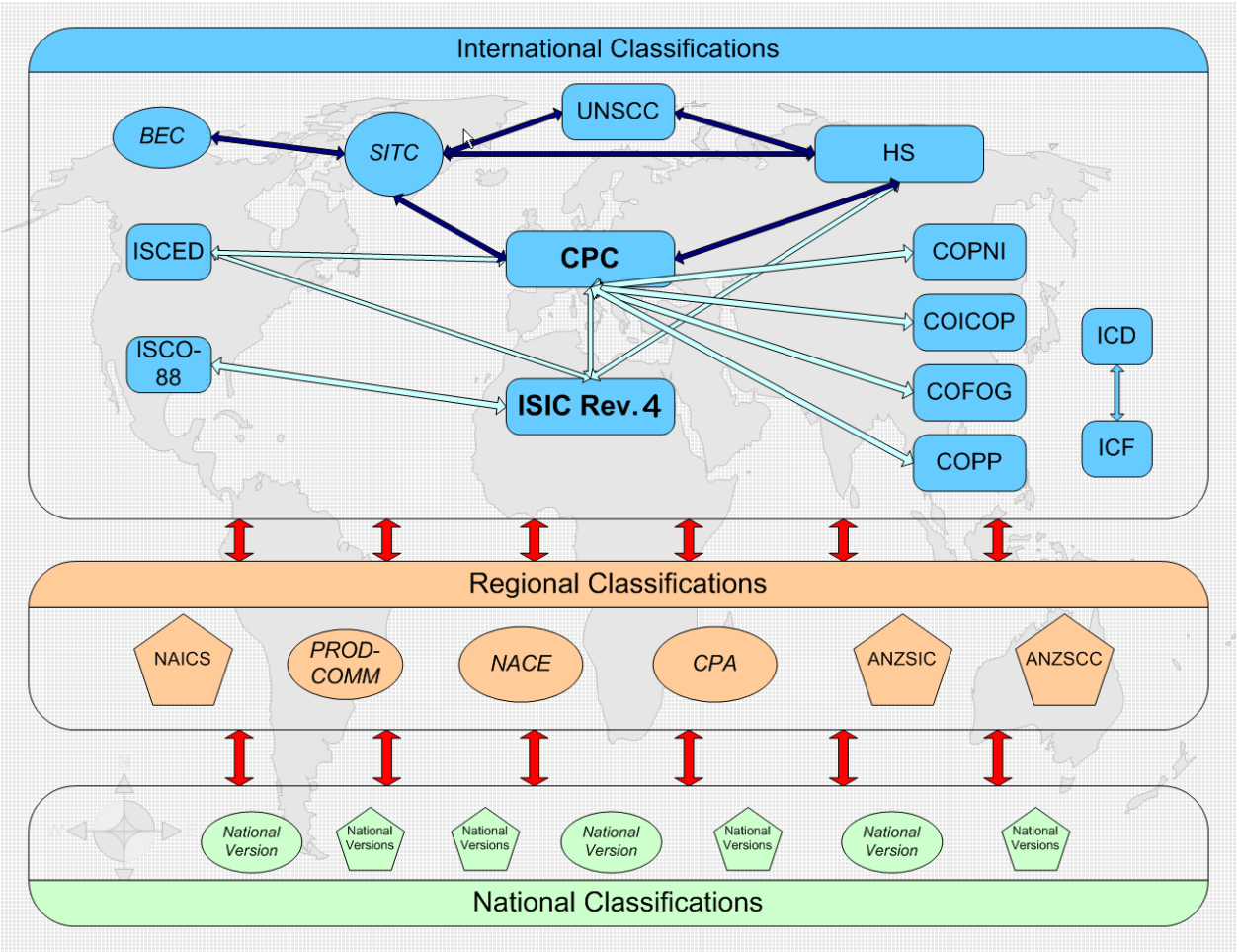


Figure 57 - International Family of Economic and Social Classification

6.2.2 Conclusion

For the development of a category “a” tool (mapping tools to map from one classification system to another classification system), a lot can be derived from category “b” tools (mapping tools to map product information to a classification system).

It has to be considered how to deal with different structures / methods and how to apply new semantic and linguistic processes.

A key finding is that today a pure IT solution is not promising. The combination and differentiation opportunities in the mapping that are for example caused by the German language are not time-efficient in terms of implementation. There are various language areas which have to be taken into consideration in a mapping tool and this increases outcome and timing issues.

Per today the process of pattern matching which is used within automatic classifications has to be kept in mind for the development of category “a” mapping tools.
However, three typical approaches are significant: syntactic, statistical and structural pattern matching have to follow a content preparation.
In the past years, differentiated content preparation was not in focus. Today it is clear that intelligent content preparation is crucial for the successful use of pattern matching. Since it is known that the method of pattern matching is not crucial for success new methods for content preparation are permanently developed. The target is to develop good structured text out of cryptic text.

This procedure is also necessary for the development of category “a” mapping tools.

With regard to this project the analysis of mapping tools is focused only on the category “a” mapping tools.

6.2.3 Market situation

6.2.3.1 General

There are at present three mapping tools, one from UNSPSC, one from GS1 Global Office and one from IFCC.

The IFCC tool is developed for internal use. Customers usually ask for a mapping table between two classification systems, mainly mapping tables between eCl@ss and UNSPSC. With the mapping tool IFCC is able to create and deliver those tables. The mapping tables are used by customers in their own system to translate catalogues from one system into another system.

GS1 Global Office developed a mapping table between GPC and UNSPSC. Both classification systems GPC and UNSPSC are managed by GS1, GPC by GS1 Global Office and UNSPSC by GS1 US. The GS1 User Community is using both classification systems because each system supports another application. UNSPSC primary supports spend analysis and procurement. GPC is also a global, multi-sector classification that is used in the GDSN, Global Data Synchronization Networks[40]. The GPC and UNSPSC mapping helps the GS1 user community to find the corresponding codes.

UNSPSC develops a mapping tool which allows capturing all possible connections between classifications and operates like a circuit. The primary objective of the tool is to provide governments with the ability to optimize customs clearance and also jurisdiction overlaps so goods may be delivered from one country to another country more easily. The secondary objective is to eventually allow companies to make their products visible in any classifications system and any language as a service.

6.2.3.2 IFCC Mapping Tool

6.2.3.2.1 General

The IFCC Mapping Tool was developed by IFCC GmbH[41] and is part of the IFCC DataOptimizer. With the Mapping Tool different classifications as well as master material data and product catalogues may be mapped with each other. At the moment this application is only available as a desktop application but will be converted to a web application soon.

To map material master to classification IFCC has developed a method which extracts single product attributes and standardizes it to the target classification.

IFCC has already mapped various classification systems partly. This includes mapping of different releases (e.g. eCl@ss 4.1 to eCl@ss 5.1) and mapping of different classification systems (e.g. eCl@ss to UNSPSC, CPV to FSC, eCl@ss to HS).

Since classification systems have different granularity, relation can be many-to-many. This is supported by the IFCC Mapping Tool. Integration in different classification systems and also mapping in both ways is possible.

6.2.3.2.2 Description

In general the IFCC Mapping Tool is able to handle company-wide as well as company specific classification systems. The class hierarchy is shown as a tree, attributes as a list.
With the tool classes and attributes may be mapped. Below refers only to mapping of classification.

[40] www.gs1.org/gdsn
[41] www.ifcc.de

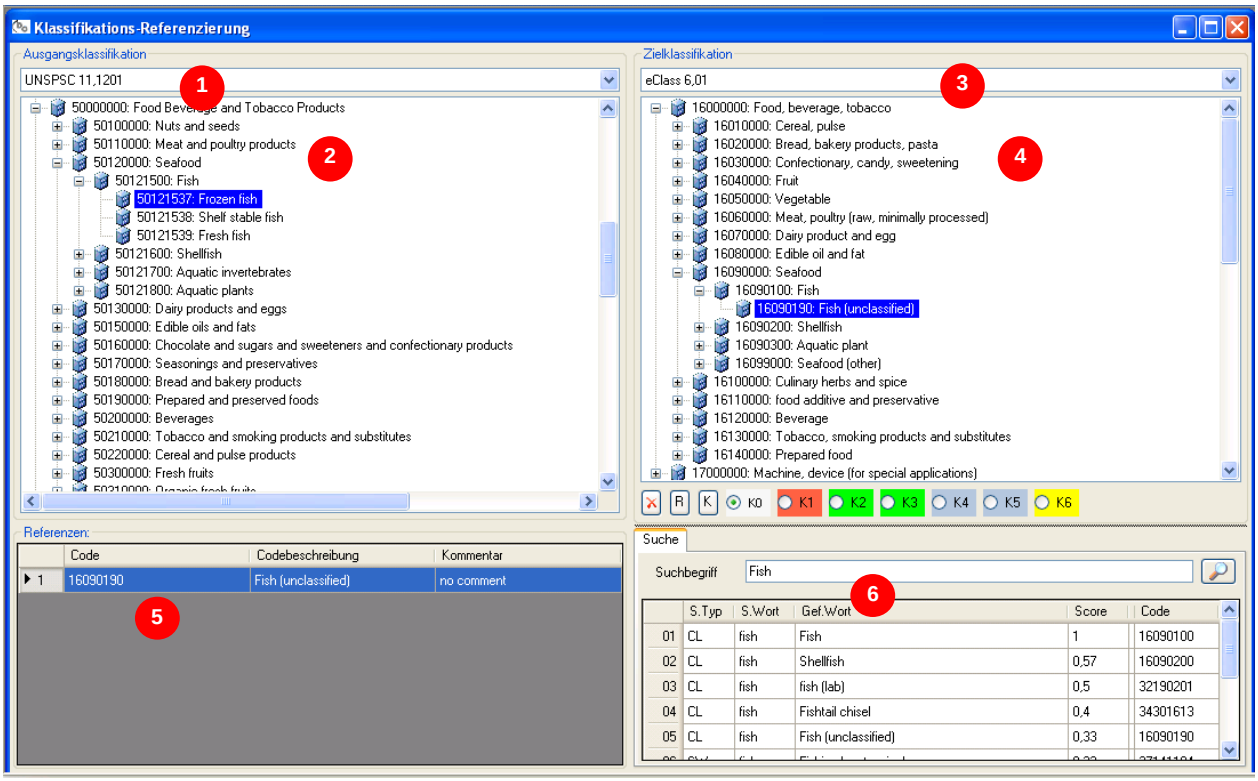


Figure 58 - IFCC Mapping Tool

Section 1:
In this choice box the starting classification can be selected. All deposited classifications are available.

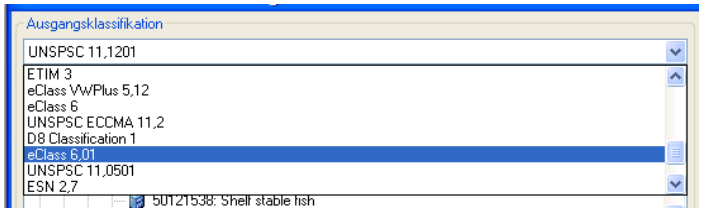


Figure 59 - Classification Selection

Section 2:
The selected classification of field 1 is displayed as a tree. On first level also the single domains are shown. With opening the node navigation can be done down to the bricks. The selected class can be connected with the target classification.´

Section 3:
In this field the target classification can be selected. All deposited classifications of the data base are available.

Section 4:
The selected classification of field 3 is displayed as a tree. On first level also the single domains are shown. With opening the node navigation can be done down to the bricks.

Section 5:
This field includes classes which were mapped to the selected ones of field 2. Multiple mappings are possible.

Section 6:
In this field the search engine is located. The search item is searched within the classification. If existent, items are searched through and will be shown in the list of findings. Findings are then evaluated and sorted in reference to their matching so the user is able to see the best results.

6.2.3.2.3 Usability of the four classification systems

The usability has to be verified in relation to system and content. In this context (this project) content means mapping tables.
The Mapping Tool is able to load and process the four classification systems. Therefore mappings can be done in parallel.
The handling of the functionalities for the classification mapping is self-explanatory. There is no help function available.
The basic difference between IFCC Mapping Tool and the here requested application is that mappings of IFCC-Tool are processed project-related. These mappings require a high expertise.

In this project we assume that mapping tables are already available and so analogue to the mapping tool of GS1 concrete mapping results may be retrieved. This definitively requires content relation as mentioned in chapter 6.

Also within the IFCC-Tool these mapping tables may be stored. This would lead to a high user-friendliness in reference to usability of the application.
Whether mapping results are feasible depends on the quality of the mapping tables. The experience of IFCC shows that due to frequent many-to-many relationships it is necessary to have a system assisted decision guidance (for example: eCl@ss – UNSPSC).

In summary: the system related usability of the IFCC-application meets the requirements of the users. Whether users are satisfied with the result depends on the content related usability.

6.2.3.2.4 Terms of Use

The IFCC Mapping Tool was developed by IFCC GmbH to process projects for customers. According to IFCC the demand of the market refers mainly to mapping tables not often mapping tools for classification system are requested.

Mapping tables are used by customers in their own systems as translation tables. The information flow to one destination is necessary (eCl@ss → UNSPSC). Therefore from the destination of the information flow there is only one-to-one or many-to-one relations possible. For many-to-many relations a manual customization of the mapping tables to the IT system is necessary.

IFCC distributes based on the need of their customers mapping tables which allow them internal use. The direct and indirect further distribution of the tables is not allowed.
Companies which buy a mapping table from IFCC have to confirm that they follow the policy agreements of eCl@ss and UNSPSC.

Currently IFCC GmbH develops a web based platform for the standardisation of material master. Mapping tables are part of this application the beta version will be available as per September 2010.

6.2.3.3 GS1 Global Office Mapping Tool

6.2.3.3.1 General

GS1 Global Office developed a mapping tool between GPC and UNSPSC. The processed versions are GPC as at 10/12/2007 and UNSPSC v10.0501.

In general GPC and UNSPSC have different aims. While GPC is an essential element within “Global Data Synchronisation Networks” of GS1, UNSPC is a classification which is not connected with other applications. This is comparable with eCl@ss.
With “GDSN” GS1 has the intention of standardised worldwide available data pools. Only items which are classified with the GPC code will be inserted in the GS1 Global Registry.

The connection between GPC and UNSPSC is institutional, syntactic and content related.

- *Institutional*: GS1 is the owner and code manager of GPC while UNDP is the owner of UNSPSC and has instructed GS1 with the administration and maintenance.
- *Syntactical:* The first three levels of the 4-Level GPC-hierarchy is according to the UN-classification UNSPSC. On the fourth level (brick) additional attributes with related values are defined (cf. GS1 Germany)
- *Content:* GPC is enhanced by the members of GS1

UNSPSC is regarded as a "global, multi-sector classification system supporting primarily spend analysis, procurement and catalogues. It has a broad industry sector participation in 55 segments including products and services."

It is planned to expand GPC step by step.

Due to the specific objective and the integration in a broad application, the question arises how far GPC can be integrated in a broad mapping tool.

6.2.3.3.2 Description

GS1 Europe Mapping Tool is programmed as a web application. This application is based on a mapping table between GPC and UNSPSC. As shown in the following figure different classification levels may be queried. „The mapping tool can be used to determine where data alignment exists between the two classifications. One can search at different levels (segment, family, etc.) in one classification system, browse simultaneously in both classification systems and find the equivalent code (if existing) from the other system." (GS1 Germany).

Mapping conflicts between eCl@ss and UNSPSC are not relevant in this case (cf. 6.1.1).
If GPC, UNSPSC, eCl@ss and CPV should be integrated content related questions will become relevant. Through the search form classes may be searched in GPC and UNSPSC. With filtering the levels and segments the search may be improved.

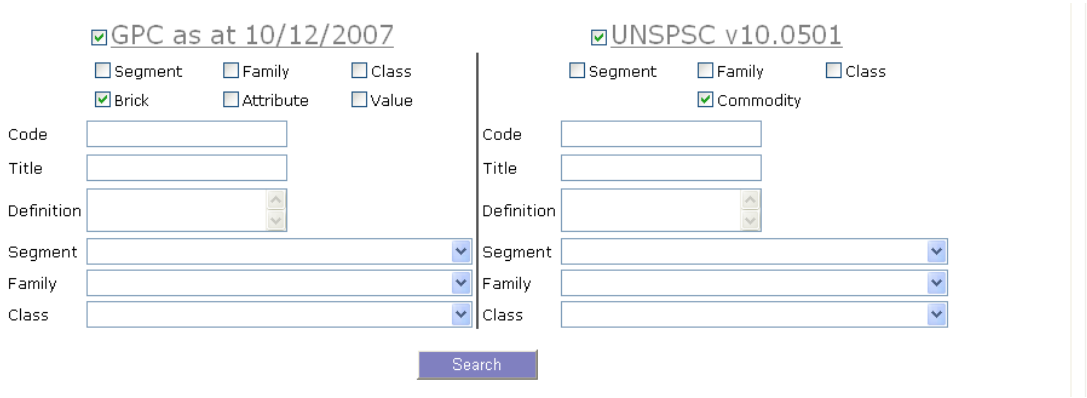


Figure 60 - Search screen of GS1 mapping tool

The result is a list according to the search criteria.

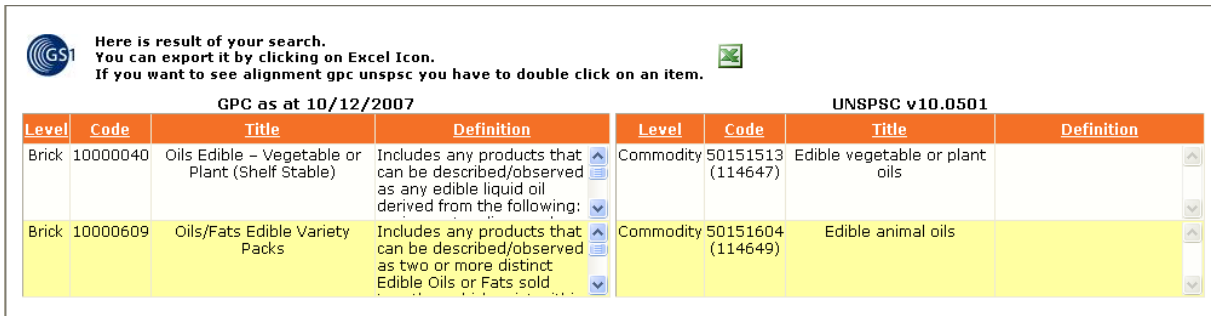


Figure 61 - Search result of GS1 mapping tool

By selecting the search result mappings between the selected code and the target classification are displayed.

Close

Brick Code	Brick Description	GPC Attributes	Commodity Title	Commodity Title	Class Code	Class Title	Family Code	Family Title	Segment Code	Segment Title
10000040	Oils Edible – Vegetable or Plant (Shelf Stable)		50151513	Edible vegetable or plant oils	50151500	Edible vegetable and plant oils and fats	50150000	Edible oils and fats	50000000	Food Beverage and Tobacco Products

Figure 62 - Mapping result of GS1 mapping tool

The results may be exported into an excel file. The results relate only to the before selected class. The exportation of the complete mapping table is not possible.

6.2.3.3.3 Usability for the four classification systems

The mapping tool was developed for the mapping between GPC and UNSPSC. Mapping of eCl@ss and CPV is not possible. The web application supports the search of mappings. With this application no new mappings can be done.

6.2.3.3.4 Terms of Use

The GPC-UNSPSC mapping tool may be used unrestricted. There is no registration needed. There is no data about terms of use for the website and the downloaded lists available. Every user may use the search functionalities and may download the results. The results always relate to the query. A complete mapping table will not be handed over.

6.2.3.4 UNSPSC referential engine

6.2.3.4.1 General

UNSPSC and GS1 US currently develop together a mapping tool called UCIC which is the phonetic abbreviation of „you see I see“.

6.2.3.4.2 Description

The characteristic of this tool is that in contrast to usual mapping tools all possible connections may be collected and ensure so the connection of all classes as a network or circuit. The user is therefore able with the search of one code to receive all belonging codes.
Objective is the visualisation of all available products and services in the market to support the business processes.

Main objective of the project is to give governments the possibility to optimize custom clearance within their legal jurisdiction so goods can be distributed from one country to another. Another objective is the support of companies which publish their products in various classification systems and languages. The advantage for the company is that they use the same concordance as government agencies.

According to UNSPSC many government agencies use their own developed classification systems. Now they are looking for commercial classification. Since two years government agencies and UNSPSC have been working closely together.

Currently there are 2.400 code sets integrated in this system and partly processed. The integrated codes are license free, free of charge and were composed by government agencies. This includes all versions of HTS (Harmonized Tariff Schedule).

6.2.3.4.3 Usability for the four classification systems

The central classification system is UNSPSC. CPV, GPC and an older version of eCl@ss are already integrated in this system. Currently an eCl@ss version is used which was launched during the time when eCl@ss was free of charge.

In general all classification systems may be integrated and processed. The integrated classification systems are partly connected with each other.

6.2.3.4.4 Terms of Use

The principals of UCIC are scientists which are working in league with GS1 US. Until now the price has not been finalized, aim is to make the subscription access very inexpensive for commercial concerns. It has not been decided yet whether a possible model will be used by government purchasing which allows companies to use the system. This would improve the traceability of the government since there would be a direct link between manufacturers and sellers for the goods and government without customs broker intermediary.

6.3 The product chain

6.3.1 Definitions

The product chain also known as “product knowledge chain” is a series of processes that lead to the definition and population of a catalogue. Definition here must be understood as the choice of meta data that are afterward populated by users.

A catalogue contains five types of data: product properties, product property values, product description data, dictionaries and classification information. These types are described below:

A product property as defined in ISO guide 77 for ISO 13584 is a “defined parameter suitable for the description and differentiation of products”. An example of a property is the weight of a product. Another example is the energy consumption. Properties depend on the type of product; a tin of beans has different properties than a tyre or a screw driver.

Property values are values assigned to the property for a specific product. For example, property value “200 gr.” for property “weight”.

Beyond properties, each product has an identification code and other textual names.

A dictionary is a grouping of products that address the same market need or intended usage. For example, the dictionary of fittings, the dictionary of domestic appliances. Products that belong to the same dictionary share properties.

A product classification system is a system that enables the assignment of each product to a product group (called ‘classification group’ or short ‘class’) corresponding to common properties or application areas (CWA 15045:2004 refers).

6.3.2 Associated business processes

The business processes that together lead to the definition of a catalogue are shown in figure 63:

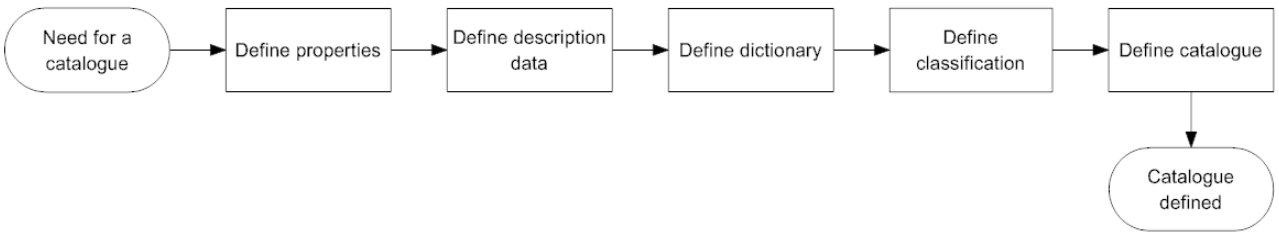


Figure 63 - The product chain processes

Five stages or processes are required to define a catalogue. They are described below.

In Figure 64, the detailed process for “Define properties” is displayed.

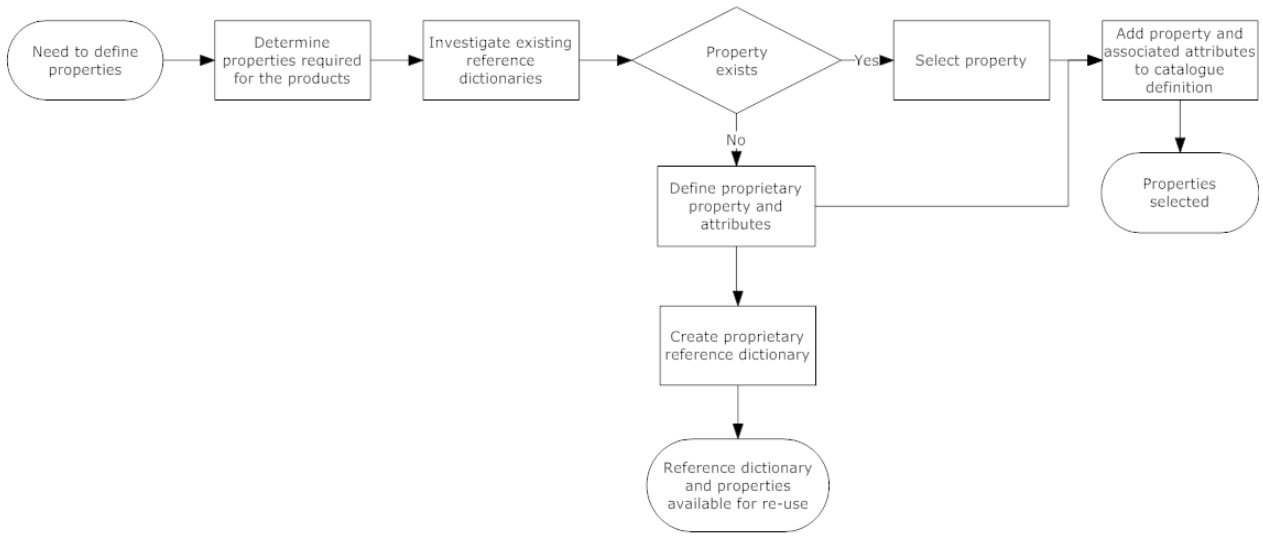


Figure 64 - The “define properties” process

In this process, the goal is to define the properties that will be populated in the catalogue. Of course, the properties will vary, because different product types do not require the same properties to be described. The first step is therefore to determine the properties that are relevant to describe the product. Many departments in the company will be involved at that stage: Design department, logistics department, marketing department, sales department, etc. in order to take into account all the needs of the supply chain. The properties are selected with their associated attributes such as value domain or units of measurement. Then reference dictionaries will be investigated to retrieve the properties if they exist. Their associated attributes are retrieved as well.

The next process, “define description data” is provided in Figure 65.

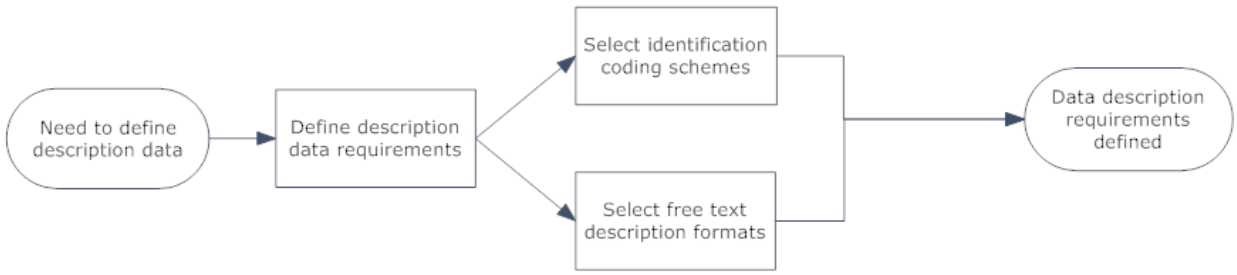


Figure 65 - The “define description data” process

Description data consist of identification codes and free-text descriptions. As above-mentioned, a unique identification code should be used to exchange data with business partners. The product will be known by one single code whatever the business partner in the supply chain is, manufacturer, logistics service provider or wholesaler. The GTIN (or Global Trade Item Number), developed by GS1 is the de facto standard for supply chain identification code.

Talking about one identification code is a limited view of the product identification. If a unique non-ambiguous code is a requirement for a seamless exchange of information along the supply chain, other identification codes are used. Internal (proprietary) identification codes are to be provided for use by the owners of the codes in their internal processes. For example, the manufacturer of a product will assign an internal identification number. This code is not intended to be used by trading partners. It is highly recommended that an internal code is mapped to one and only one GTIN.

Product description data also consist in free text description. There might be more than one description in order to cater for different needs. For example, in the retail industry, there is one generic description, a short description used on check out tickets and an extended description that is required to further describe technical products such as domestic appliances.

After specifying the description data, the next process is to define dictionary. This process is shown in Figure 66.

Figure 66 - The “define dictionary” process

In this process, the requirement is to group products that share the same market need or intended usage. The grouping key is the value and the property that are used to actually group the products.

The fourth stage is the “define classification” process. It is described in Figure 67.

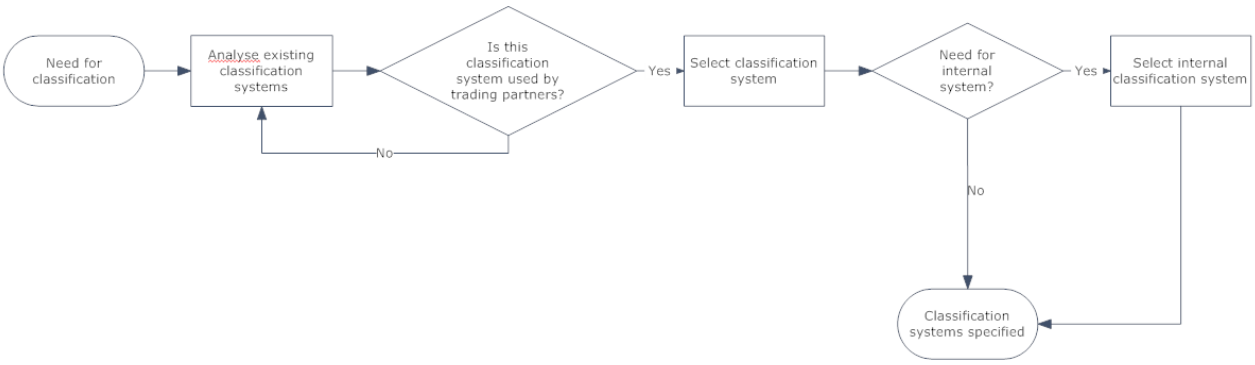


Figure 67 - The “define classification” process

As shown in the CWA, there are four main product classification systems in use in Europe and they can differ in many ways. Choosing the appropriate system is important since the interoperability of the system is limited. The choice will be based on the practices of the business partners. It may also happen that for each product there is a need for populating more than one classification code.

In addition, the classification code might be understood as an interface tool, used for communication with the trading partners when an internal classification code will be favoured for internal processes. Both codes will have to be implemented.

After these four first steps, the last step called “define catalogue” is detailed in Figure 68.

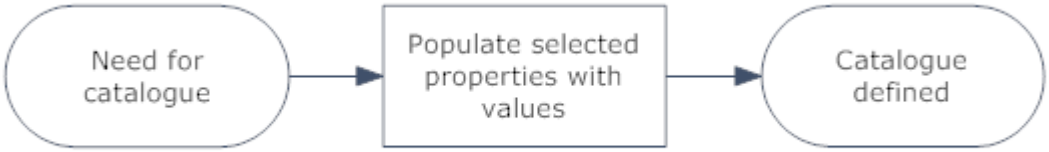


Figure 68 - The "define catalogue" process

In this last process the company defines the values to the selected properties.

6.3.3 The standardisation environment of the product chain

With regards to **properties**, the German initiative DINsml by the German National Standardization Body DIN[42] has defined a set of product properties. They are standardised on a German national basis. In 2010, these properties will be integrated into the ISO Concept Data Base. They will therefore be available to all users and will become internationally standardized properties.

The ISO CDB is a web-based data base[43] for the development, standardization and publication of standardized concepts. The goal of the ISO/CDB is to standardize and publish common concepts on an international basis and make them available to users via a web-database.

As far as **description data** are concerned, the main piece of data, the identification code can be implemented with the GTIN, or Global Trade Item Number, formerly the EAN code. The GTIN is a solution that enables global unique identification and decentralized allocation of the codes by users themselves. Although it originated in the retail industry, the GTIN is used by many sectors and nothing prevents its adoption by other industries.

The structure of **dictionaries** has been defined in the ISO 13584 standard. Although the standard is available most of the dictionaries do not comply with the rules and models defined in ISO 13584.

Among many reasons, the complexity of the standard explains why it is not used. A light version of the standard has been requested; tutorials are currently being developed to help SMEs use this standard in the eSMEs CEN focus group.

The situation for **classifications** is described in this study… four main classifications systems in the EU, with interoperability issues. See the recommendations in section 5.

The environment for catalogues sees a large number of formats in usage with more than 400 different formats. There is a need for harmonisation.

The **exchange of data** between catalogues is covered by ISO 29002. UN/CEFACT also provides EDIFACT and XML formats which have been used worldwide in the case of EDIFACT for more than 20 years.

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[42] www.dinsml.net

[43] See http://www.iso.org/iso/standards_development/it_tools/it_applications/iso_concept_database_cdb.htm

7 Summary

7.1 General

The CC3P project is one project in the sequence of project within the CEN/eCat workshop dealing with the deep analysis of product classification systems used for e-procurement and e-commerce in the public and private sectors.

A classification system is a categorization system into which things that means the centre of discurs can be ordered in. The concepts of a classification system can be described by name of the concept and/or by additional attributes.

In addition a product classification system is a classification system for categorizing products or product descriptions.

In practice there is a number of product classification systems used depending on different application scenarios. Different product classification systems are used for public and private e-procurement, for different countries, different vendors and different company sizes.

Although there are a lot of different product classification systems available, one major difference between these product classification systems is their scope in terms of market share and coverage. In general, one can differentiate horizontal and against vertical product classification systems. Horizontal product classification systems try to cover all products within all markets and sectors. Vertical product classification systems reflect the market of products within one or more industry sectors or application areas.

In the CC3P project four different horizontal product classification systems have been selected for analysis. These product classification systems can be assumed as the most popular horizontal product classification systems used in world markets. Nevertheless, their market coverage heavily depends upon the actual status in terms of scope for public or private e-procurement and the origin of the maintenance authority responsible for the development of a product classification system.

The four product classification systems chosen for the analysis are:

- CPV
- eCl@ss
- GPC
- UNSPSC

CPV is the official horizontal product classification system used by public European governments for e-procurement. eCl@ss is a product classification system mainly used by private sectors for e-procurement and e-commerce, especially industry sectors. GPC as product classification system is mainly used by trading companies of the private sectors. UNSPSC is a product classification system used by public governments in the US markets and large world-wide operating companies for product categorization and procurement.

Chapter 4 as shown a detailed description of these four product classification systems taking into account

- the history of the development,
- the intended purpose and
- the structure of the different product classification systems.

In addition,

- the release policy and roadmap,
- the version compatibilities,
- the development process and
- the conditions of use

for the different product classification systems has been described.

As the result the following table summarizes these descriptions of the different product classification systems.

Classification	Owner	Intended purpose	Structure	Release policy	Compatibility	Version(s) in use	Maintenance process	Conditions of use	Languages	Download formats
CPV		Tender process and information about public contracts in Europe.	4 levels + Complementary vocabulary to supplement the main vocabulary.	1 version every 3-4 years	No	Only one.	No change request process. Informal request system.	Free	22	PDF XML ODS XLS
eCl@ss	eCl@ss e.V.	All eBusiness processes along the supply chain (spend analysis, procurement, catalogues, product data management, CAx etc.)	4 levels + properties attached to 4th level. Product classified at lowest level only.	2 versions 1 year (minor releases) 1 version every 3-4 years	Transaction update files provided for MajorReleases. Minor releases are backward-compatible.	Any version is usable.	Change request process	Free on the website Download fee (depends on the company size and membership)	15 (different components)	CSV XML (in versions after version 6)
GPC	GS1 Global Office	Master Data Synchronisation (GDSN)	4 levels + Attribute – Attribute Value pairs.	2 versions a year	Backward Compatibility with Delta Reports (current vs. previous)	One version in GDSN. Any version otherwise.	Change request process	Free	5	XML TXT XLS
UNSPSC	UNDP	Electronic commerce Spend analysis	4 levels	2 versions a year	Backward compatibility	Any version is usable.	Change request process	Free for PDF Membership fee for XLS	15	PDF XLS

Figure 69 - Summary of the four product classification systems CPV, eCl@ss, GPC and UNSPSC

After the comparative description of the product classification systems evaluated in the CC3P project a deep analysis has been done. This analysis has been set up by a two step approach, where the first step serves for an analysis at the so called segment level whereas the second step serves for an analysis at the class level. The intention of this analysis was to find out differences and similarities between the analysed product classification systems to extract recommendations to prepare a harmonization of the product classification systems. As a result a number of recommendations could be given to support this harmonization. Following these recommendations can lead to a combined or at least synchronized development and coexistence of the four classification systems although a conclusion of some product classification systems is recommended to facilitate the usage of product classification systems in e-procurement and e-commerce and to prevent maintenance and processing effort.

7.2 Classification authority

The recommendations given according to the classification agencies can be summarized as follows:

- For each product classification system at least one classification agency shall be responsible and maintain the root classification system.
- The classification agency shall be responsible in defining an open and transparent maintenance process.
- Each classification agency is responsible in defining a process that meets the attributes Openness, Consensus, Balance and Transparency.
- Each classification authority shall maintain a register of interoperable classification systems to meet the requirements of the maintenance and data model according to “meta-standards”.

7.3 Maintenance process

The recommendations given according to the maintenance process can be summarized as follows:

- Introduce or adjust to a standardized maintenance process
- Take the Gen-ePDC maintenance process as a reference process for evolving and maintain a harmonized classification system by defining synchronization points between the different distributed classification processes
- The maintenance process shall be governed by one agency. A good starting point might be the combined maintenance of CPV and eCl@ss by one classification authority.
- Provide a mapping table for hierarchy synchronization for the different classification systems and maintain this table based on the synchronized maintenance process.
- Provide class level integration for product data synchronization as starting point

7.4 Data model and content

The recommendations given according to the data model and content can be summarized as follows:

- Introduction of an international, standardized data model
- Introduce the same data model or try to be compatible/interoperable
- Use an identification scheme (unique identifiers) in addition to class numbers
- Introduce naming principles
- Introduce a single common library of terms and definitions
- Deliver a definition for each class
- Separate application area from class description
- Add information in brackets for translational purposes
- Take the Gen-ePDC data models as the basis for the development and maintenance of classification systems
- Take CPV classes as starting point
    - Enhance CPV classes by eCl@ss attribute lists and attributes
    - Enhance CPV by missing classes of eCl@ss
    - Use eCl@ss and/or standardized attributes for class description
    - Extend this combined classification system by GPC bricks and brick attributes
    - Extend this combined classification system by UNSPSC classes where necessary

These general recommendations are extended by recommendations dedicated to each product classification system. A list of product classification system specific recommendations are given is chapter 5.1.6 for the segment level and chapter 5.2.6.2 for the class level analysis.

Beside the harmonization of the analysed product classification systems which is a mid or long term strategy, a first step to facilitate the usage of product classification systems is the possibility to map the codes for product classes between the different classification systems. By doing this, products can be classified by different codes depending of the product classification system used in the envisaged markets. Chapter 5.3 has shown the main outcome of the mapping analysis.

In chapter 6 some application scenarios for product classification systems are given taking into account, sourcing, manufacturing, marketing and sales, service and e-catalogues for e-procurement. In addition a short market overview and features expected by tools which support this kind of code mapping between product classification systems is given.

The analysis of the product classification systems has shown that not only a harmonization of the product classification systems is possible and recommended but also a mapping between these classification systems is in general possible. As this, the mapping of product classification systems can be seen as a short or mid-term solution to overcome the problem of classifying product for different application areas by different product classification systems (semi-)automatically. The harmonization of the product classification systems is also possible but can be seen as second step for the mid or long term strategy to consolidate the market of

product classification systems and to facilitate the exchange of product information defined by product classification systems. More work has to be done to extend the analysis started in this report to all domains covered by the different product classification systems (not only the 6 six domains covered by this report). In addition to define and establish a synchronization process between the different maintenance agencies of the different product classification systems to reach a harmonized market for product classification systems and to fully take advantage of consolidated product description for e-business.

8 Annex A: Bibliography

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CWA 15295:2005*, Description of References and Data Models for Classification (ePDC project)*

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CWA 15556-3:2006, *Product Description and Classification – Part 3: Results of development in harmonization of product classifications and in multilingual electronic catalogues and their respective data modelling (Gen-ePDC project)*

CWA 16100:2010, *Guidelines for the design, implementation and operation of a product property server (ePPS)*

DIN 4002, DIN Property Server www.dinsml.net

eCl@ss www.eclass.eu and www.eclass-serviceportal.com

eOTD ECCMA Open Technical Dictionary www.eecma.org

ETIM www.etim.de

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SIMAP European Portal for Public procurement http://simap.europa.eu/index_en.htm

UNSPSC United Nations Standard Products and Services Code http://www.unspsc.org/