Coding Standards Benefiting Product and Service Information in E-Commerce

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Abstract
E-Commerce can be streamlined if products and services are unambiguously identified with industry-agreed XML tags through the coding of products and services according to standard classification conventions, such as the Universal Standards Products and Services Classification (UNSPSC). Standardized coding allows for more effective electronic purchasing management by spend analysis, and assists marketing and sales functions to provide better customer and distribution channel services.

With its hierarchical taxonomy and open standards, the UNSPSC is considered superior to existing product coding schemes. Care should be taken to further bind up such systems with taxation harmonization efforts such as those pursuant to the revised Kyoto International Convention on the Simplification and Harmonization of Customs Procedures under the auspices of the Customs Co-operation Council (World Customs Organization).

1. Introduction
Procurement has been identified as one of the key areas for the application and integration of electronic commerce tools and techniques [5]. Classifying products and services with a common coding scheme facilitates commerce between buyers and sellers and is becoming mandatory in the new era of electronic commerce [9].

Product classification and coding is yet another aspect in the struggle for e-procurement standards. There are several challenges in terms of standards in order to make B2B electronic commerce workable. These challenges arise at several levels:

- Different standards for describing products (e.g. UNSPSC).
- Different standards for describing product catalogues (e.g. Ariba versus CommerceOne).
- Different standards for describing exchangeable business documents such as purchase orders (e.g. XML Common Business Library (xCBL) versus Commerce XML (cXML)) [8].

E-Procurement technologies help change the role of the purchasing department, from a transaction-oriented function to a more managerial one that focuses on establishing and maintaining relationships with suppliers, third parties, and internal customers, and leveraging corporate buying power [4]. It allows, in marketing and distribution, to register a product at web search engines and catalog aggregation, to prepare pre-coded catalog files for specific customers, to minimize errors, to allow for uniform and transparent benchmarking and capturing up to microdata from sales, and to stay current with marketing trends. In effect, with a single tag, a manufacturer or service provider may propagate its commercial offering globally and capture its response, for further strategic decision-making.

2. Research Objective and Methodology
This early stage research focuses on the aspects of the coding challenge of accurately describing the product, which is a key step prior to creating a catalogue and exchanging business documents. Product information originates with the supplier of the product, and then automatically circulates throughout networked electronic systems. The product's descriptive information are important for the spend analysis and the automatic marketing (on Internet and proprietary networks), as well as the appropriate taxation of the product from a regulatory standpoint.
In taxation, product and service coding allows for the correct, transparent application of customs and VAT on sales taxes, minimizing conflicts and allowing for less interruption in interstate commerce. An example of this would be the U.S. Streamlined Sales Tax Project, which attempts to create common definitions for goods and is looking at automating and transferring the burden of proof for exemptions to buyers in coordination with the business community [7].

Therefore the research objective of this paper, part of more fundamental research in progress, is two-fold:

- To examine the role of common coding standards towards benefits of spend analysis;
- To discuss the correlation between a coding standard such as the UNSPSC and the Harmonized System (HS) for taxation.

The methodology of this research in progress includes literature review and references to ongoing case study analysis, with future directions of this research to be a case study of an integrated UNSPSC/HS coding application of which an outline is presented in this paper.

3. Spend Analysis

Large companies are beginning to code purchases in order to analyze their spending and a recent study by the Center for Advanced Purchasing Studies [2] showed that over half the companies surveyed use commodity codes – several had complex codes of 10 or more categories. Expense factors which have become increasingly apparent have been the plethora of coding schemes for products, services, and suppliers, and the large number of marketplaces in which companies and government agencies make their purchases [3].

Beyond spend analysis, when purchasing professionals go into cyberspace to buy an item for the first time, they should want to locate, with ease, the largest possible set of suppliers around the globe. Product classification standards allow them to do this without relying on large parametric search engines [6]. Product and service coding benefit the purchasing function, in that it allows for supply line discounting, analysis of expenditure in a uniform way, and allowing for the consequent strategic sourcing decisions, integrating internal processing flow, compliance control over spending and integrating card data with transactional data.

In order to streamline spend analysis, classification of products and services must be done in a manner that is industry standards for interoperability and that gives room for product and service expansion.

3.1 Classification versus Identification

Identification codes are different from classification codes and will not server the purpose of supply line discovery, spending analysis or product awareness. The differences between classification and identification codes may be highlighted as follows in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Classification Code</th>
<th>Identification Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>Indicates relation of item to other items, similar and dissimilar</td>
<td>Unambiguously identifies item</td>
</tr>
<tr>
<td>Principle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Code</td>
<td>Hierarchical</td>
<td>Uniqueness</td>
</tr>
<tr>
<td>Characteristic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digits of the</td>
<td>Show classes and subclasses in which item is member.</td>
<td>Create a one-to-one correspondence between the symbol and item. (Digits have no other</td>
</tr>
<tr>
<td>code…</td>
<td></td>
<td>meaning.)</td>
</tr>
<tr>
<td>Business</td>
<td>Finding goods and services. Analysis of activities for further improvements.</td>
<td>Tracking and record keeping.</td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Having a taxonomy of names and categories can provide "roll up", "drill-down", and comparability analysis and evaluation. A taxonomy organizes all the available goods and services into logical categories. "Drill-down" analysis allows the searcher to find among a vast group of products and services exactly what they need. "Roll-up" analysis allows searchers to group transactions, e.g. into a compatible group such as 'office supplies' to perform analysis.

4. UNSPSC Coding System

The UNSPSC coding system is an open, global electronic commerce standard that provides a logical framework for classifying goods and services [9]. The UNSPSC is designed to serve three primary functions:

1. Resource Discovery - the identification of relevant suppliers of a specific product or service
2. Expenditure Analysis - reporting on the use of funds
3. Product Awareness - the integration of one’s products or services into the common nomenclature that prospective customers use to search for products and services.

The UNSPSC began as a merger between the United Nation’s Common Coding System (UNCCS), itself based on the United Nations Common Procurement Code (CPC), and Dun & Bradstreet’s Standard Product and Service Codes (SPSC). To merge the two existing coding systems, Dun & Bradstreet (D&B) and the Inter-Agency Procurement Services Office (IAPSO) within the United Nations Development Program (UNDP) established a Code Transition Team, which merged the UNCCS and the SPSC code structures. The team consulted procurement professionals, public documents and industry experts to ensure accuracy and the common use of names, groups and definitions. To further ensure coding completeness and accuracy, the UNSPSC coding team cross-referenced the new UNSPSC to a number of other classifications systems, including the Common Procurement Vocabulary (CPV), the Standard Industrial Classifications (SIC) and the Harmonized System (HS). The team documented commonly used terms to avoid the use of synonyms and to clarify the meaning for the many UNSPSC customers. The definitions of the segments were worded carefully to be both inclusive of their subgroups and exclusive of other segments and their subgroups [9].

The UNSPSC classifies products and services on five levels: segment, family, class, commodity and business function. Its hierarchical structure consists of two-, four-, six-, and eight-digit levels, depending on the specific needs of the user. Each subsequent level of detail involves a subset of codes and descriptions preceding it in the code's hierarchy [9]. UNSPSC codes can optionally be extended by adding a ninth and tenth digit after the commodity number. These numbers can indicate business relationships with the supplier such as rental/lease, wholesale, retail, or original equipment manufacturer (OEM).

With more than 8,000 categories to classify the products and services bought and sold everyday, the UNSPSC can facilitate a company’s procurement system by streamlining procurement processes by standardization, reducing integration costs and increasing financial performance. Companies that implement the UNSPSC with their procurement systems can also reduce new product development and manufacturing time. To realize their full potential, procurement systems are often integrated with a relational database system or other data mining capability. The UNSPSC complements these systems by providing data standards for both customers and suppliers, creating standardized reporting and analysis capability.

The UNSPSC system serves all these functions and also can be used as a high-level index to cross-reference products and services with given suppliers, resulting in maximum purchasing power. Businesses can easily track and monitor expenditures, internal spending limits and purchase authorizations by encoding current and legacy data with UNSPSC codes down to category details.

The UNSPSC also helps enable companies to achieve significant savings in procurement and marketing costs not only through reduced internal processing and management but also by enabling increased leverage with suppliers by facilitating greater volume. Companies successful in incorporating the UNSPSC system have the ability to save between 5 to 15 percent of corporate spending, according to the ECCMA [9].

5. Coding Comparisons

Is there a driving force that will create a truly global economy? Many thought that the Internet and e-business would be that driver, but even in today’s Internet economy pockets of localized business or industry specific business, with their own business language, utilize different schemes for coding. For example, initially, three categorization taxonomies have been identified and made up a core part of the UDDI Operator (Ariba) registries. These are the North American Industry Classification System (NAICS), UNSPSC, and an unnamed geographic taxonomy. A fourth category is also extant – named “ETC” – for general-purpose keyword type classification [12]. Other coding schemes such as SIC, UCEC, and eclave all take into account some measure of local or industry specific specialization.

Global standardization, as seen from a coding perspective, is a highly delicate matter. Indeed, in adopting standards, it is important, first, to understand what is being standardized. Trends in industry adoption and functionality inclusion in e-procurement software indicate that XML could become the globally accepted syntax standard, UN/EDIFACT could be the accepted for the global data dictionaries, and that the UNSPSC will most likely be accepted as the global commodity classification system. This does not mean that regional standards will not also occur – which unfortunately means the possibility of continuing systemic inefficiencies, and hence more, not less work for procurement and market analysts.

The technical differences between UNSPSC and some other coding schemes are outlined in Table 2.
Table 2. Coding Comparison

<table>
<thead>
<tr>
<th>Scheme Name</th>
<th>Chief Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIC/NAICS [Standard Industrial Classification / North American Industry Classification System]</td>
<td>• Identifies broad industry, product, and service categories</td>
</tr>
<tr>
<td></td>
<td>• Too high level for effective spend analysis.</td>
</tr>
<tr>
<td></td>
<td>• Unable to drill down to contractible groups.</td>
</tr>
<tr>
<td>UCC/EAN [Uniform Code Council / European Article Number]</td>
<td>• Product identification code, not classification code (see section above)</td>
</tr>
<tr>
<td></td>
<td>• Identifies branded merchandise by manufacturer</td>
</tr>
<tr>
<td></td>
<td>• No item hierarchy; strictly used for identification</td>
</tr>
<tr>
<td></td>
<td>• Used by local government purchasing agencies</td>
</tr>
<tr>
<td></td>
<td>• Maintains hierarchy</td>
</tr>
<tr>
<td></td>
<td>• Proprietary code (fee-based usage)</td>
</tr>
<tr>
<td></td>
<td>• Proprietary codes only useful to a single company.</td>
</tr>
<tr>
<td></td>
<td>• Expensive to require trading partners to use same code.</td>
</tr>
<tr>
<td></td>
<td>• Not maintained.</td>
</tr>
<tr>
<td></td>
<td>• Limited or non-existent hierarchy.</td>
</tr>
<tr>
<td>NIGP [National Institute for Government Procurement] Internal/Proprietary</td>
<td>• Identifies product and service by category</td>
</tr>
<tr>
<td></td>
<td>• High specificity</td>
</tr>
<tr>
<td></td>
<td>• Multiple hierarchies allow aggregation/disaggregation to any relevant level of analysis</td>
</tr>
<tr>
<td>UNSPSC</td>
<td>(Source: UNSPSC [9])</td>
</tr>
</tbody>
</table>

From a technical perspective, only the UNSPSC code contains the key characteristics of a good naming convention as outlined above. The other codes may contain some characteristics, but not all. For example, the United States' SIC code structure (now being superceded by the North American Industry Classification System), is hierarchical but not to the detailed level necessary for efficient search and analysis. Table 3 indicates the suitability (or not) of some of the popular code symbologies for product and service classification.

Table 3. UNSPSC classification meets the requirements for marketing and procurement.

<table>
<thead>
<tr>
<th>Code</th>
<th>Classification or Identification Code</th>
<th>Unique Numbers for Items</th>
<th>Responsive to Market - Time to get new Code assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNSPSC</td>
<td>Classification X</td>
<td>X</td>
<td>Days</td>
</tr>
<tr>
<td>SIC/ NAICS</td>
<td>Classification X</td>
<td>(high level)</td>
<td>5+ years</td>
</tr>
<tr>
<td>USS/ EAN</td>
<td>Identification X</td>
<td>Varies by Mfr.</td>
<td></td>
</tr>
<tr>
<td>NIGP</td>
<td>Classification X</td>
<td>Years</td>
<td></td>
</tr>
<tr>
<td>Internal</td>
<td>Classification</td>
<td>Usually fixed</td>
<td></td>
</tr>
</tbody>
</table>

(Source: UNSPSC [9])

The retail bar codes of the UCC and EAN conventions have no hierarchies.

UNSPSC allows lots of different industries to harmonize their classification and description of products and services, regardless of their own parochial nomenclatures. However, as one can expect, there are concerns that too many regional differences exist for a global coding scheme to work fully at all levels. UCEC (Universal Content Extend Classification, based on UNSPSC), ecl@ass (a German coding and catalogue standard organization) and others focus on more regional concerns, as does SIC in the United States. Cultural differences and attitudes inspired thereby, or the perception thereof, appear to drive some differentiations, rather than other, rational or rationally articulated concerns. For example, UCEC is hailed as:

"……a new "European classification standard", built "in association with European universities" and "soon to be placed in the public domain. UCEC, by not only defining product classification, but also characteristics, opens new comparative purchasing vistas, 'vital to closing a sale', according to Content Europe VP, Jerome Lindström…" The currently widely-used United Nation's UN/SPC (Universal Standard Products and Services Classification) standard fails to take a product's whole spectrum into account', pursues Lindström. What's more, UN/SPC evolutions bypass Europe, with the risk of imposing de facto American dominance in world-wide product classification in the e-market place…"[1].

In all of this discussion, any value added by the other standards is not made apparent.

Through the Electronic Commerce Code Management Association (ECCMA), which is the non-profit organization that oversees the management and development of the UNSPSC Code, a pilot scheme was entered into in mid 1995 with Visa U.S.A. and Dun and Bradstreet to provide businesses with detailed transaction reports of products paid for with a Visa Purchasing card. Within the purchasing reports, expenditures are grouped according to the UNSPSC. This "line item detail" passed through Visa's processing network, enabling Visa to provide pilot clients with a variety of reporting and analytical capabilities to help them streamline purchasing, maximize efficiency and reduce costs.

The UNSPSC also simplified Visa's delivery and use of information by providing their customers with a mechanism for more accurate monitoring of internal spending limits, purchase authorizations and allocations. The categorization of every purchase according to the UNSPSC codes allowed strategic product and supplier management through more accurate, dynamic aggregation of similar products and their suppliers.

Visa U.S.A. supports the UNSPSC and new product developments that provide customers the ability to further improve their procurement processes and reduce costs. "Visa strongly endorses the UNSPSC standard and will continue to work with D&B to facilitate online purchasing and procurement on a truly global, unified basis," says Marcie Verdin, Vice President of Purchasing Card for Visa U.S.A. "Valuable procurement data provided by the new classification system and D&B's comprehensive database, paired with the superior reporting functions of the Visa Purchasing card, delivers a single integrated solution to companies managing procurement on a universal scale" [9].

7. Open Market e-Commerce

The end goal of electronic commerce is an open market commodity exchange. For a commodity to be traded on an exchange there must be a clear specification and an authority to which to appeal if the product delivered does not match the specification. Many B2B applications today are attempting to extend the UNSPSC for their applications so that they can conveniently interconnect with other web sites also using the standard coding scheme. While this ontology is not expected to be complete enough for any single application, it is expected to be a reasonably top level or umbrella structure for most services and products applications.

A UNSPSC code is involved in most e-commerce transactions, including in:
- Searching for products on web sites that use XML metadata tags according to the UNSPSC standard
- Ordering products and services directly from the supplier’s product catalogue, knowing that they match the product description of what is required, via the UNSPSC standard;
- Approval of purchases before order is sent, given the standard coding matches;
- Receiving of goods, Invoice processing , and payment transfer: made easier by knowing the description of the product should be valid;
- Use of trading partners as preferred suppliers, knowing they adhere to a particular type of product description; or
- Document archiving which supplier’s buyers will have access to, and will search a product description.

An open market exchange has its challenges as well, including taxation across geographies.

8. Taxation and Harmonization for e-Commerce

8.1 Policy Issues Relating to Continued UNSPSC and HS Coordination

A deterrent to global e-business is taxation in the sense that correct application, transparency of imposition and, generally, certainty of taxation particularly in the indirect taxation (customs and value added) area, remains an issue. As industry classifications are maintained by governments and used for the purposes of customs and other indirect taxation application, their harmonization is key to overcoming this issue.

As indicated above, there are symbologies such as UNCCS, NATO codes, industry specific codes or UCC/EAN that do coordinate with taxation coding. However, as also previously mentioned, the UNSPSC is cross-referenced to the Harmonized System of the World Customs Organization (WCO). The Harmonized Commodity Description and Coding System, generally referred to as "Harmonized System" or simply "HS", is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). It comprises about 5,000 commodity groups, each identified by a six digit code, arranged in a legal and logical structure and is supported by well-defined rules to achieve uniform classification. The system is used by more than 177 countries and economies as a basis for their Customs tariffs and for the collection of international trade statistics. Over 98% of the
merchandise in international trade is classified in terms of the HS [11].

The HS contributes to the harmonization of Customs and trade procedures, and the non-documentary trade data interchange in connection with such procedures, thus reducing the costs related to international trade. It is also extensively used by governments, international organizations and the private sector for many other purposes such as internal taxes, trade policies, monitoring of controlled goods, rules of origin, freight tariffs, transport statistics, price monitoring, quota controls, compilation of national accounts, and economic research and analysis. The HS is thus a universal economic language and code for goods, and an indispensable tool for international trade. The Harmonized System is governed by the International Convention on the Harmonized Commodity Description and Coding System, known as the Kyoto Convention [11]. This Kyoto Convention entered into force in 1974 and has since been revised in 1999 to meet current demands of international trade. In addition to the Kyoto Convention, there is the International Convention on the Harmonized Commodity Description and Coding System of 14 June 1983 (amended in 1986), with a view to ensure "a close correlation" between the HS and the Standard International Trade Classification (SITC) of the United Nations.

Roll-over or cross-referencing code structures, generally the integration of codification into an UNSPSC structure, is highly desirable. A peculiar issue that needs care is the development of codification efforts, particularly so that UNSPSC and HS do not move out of line. In this regard, one should note the differences in terms of handling, and hence the timing, of coding adaptations. Indeed, new coding may be requested from the UNSPSC secretariat if one does not find an appropriate code. However, a new classification under the HS requires the approval of the Harmonized System Committee. It is obvious that the disjointing of mechanisms could occur if handling and timing issues differ too substantially within HS and UNSPSC, respectively. Given new technology and product and service development, this risk is not remote. Hence, from a policy standpoint, and in order to benefit both e-commerce development and, indeed, worldwide trade development, two measures appear desirable.

First, both systems and their mantle organizations would benefit from a structured coding adjustment coordination system. In practical terms, no new UNSPSC code should be introduced without at least notification at the WCO’s HS authorities, and a coordination of approvals appears key to successfully keeping both systems in line and relevant.

Second, a dispute settlement mechanism regarding coding standards does not formally exist, so it appears, at present. Even within the UNSPSC system, it would be welcome, given the increasing importance of coding as a procurement and marketing tool, among others, to have an efficient dispute settlement mechanism that may decide swiftly on arguments and disputes between the secretariat and users/applicants, so as to validate coding good governance and avoid the implication of national courts, often through lengthy and costly litigation, in the system, possibly distorting its international and worldwide level. Moreover, a dispute settlement mechanism would benefit each and both the UNSPSC and HS system.

8.2 A Practical Application of HS / UNSPSC Coding in e-Commerce:
PricesAroundtheWorld.com Inc., (PAW).

PAW is a Washington D.C. based decision support company that provides price information to buyers and sellers worldwide. Using HS and UNSPSC classification standards, PAW provides comparative pricing on a global scale. The SAS Institute, the largest privately owned software company in the world, invested in PAW and brought to PAW its experience in data mining, a key tool in price analysis.

PAW is part of a group of companies under Public Warehousing Company (PWC), a publicly traded company specializing in logistics, price research, e-commerce, and customs technologies. PWC owns the controlling interest in PAW as well as in Inspection & Control Services (ICS).

In conjunction with Microsoft Corporation, PWC owns one of the world's most technologically advanced Internet-based customs system called e-Mirsal (www.emirsal.com). This system is being used, among others, by the Government of Dubai and offers a suite of Internet-based services that allow the importing/exporting public to complete customs and logistics-related transactions online.

Inspection Control Services (www.icsinspections.com) is a UK-based company, whose technology and executive offices are based in Washington DC. The company has an international network of 50 office locations with price analysts connected by a proprietary Internet-based system that provides on-demand price research conducted in accordance with the stipulations of GATT Article VII. Article VII entails that research and analysis of prices may be used in court to settle customs and valuation disputes. ICS has revenues of approximately $ 30 million, and is currently offering its price research to
governments in Latin America, Asia, Africa and the Middle East.

**PAW offers four lines of services:**

A. Classification/Tagging: PAW uses UNSPSC as well as the HS Code to classify products so they can be compared to similar products worldwide. Although classification standards change, suppliers' products listed on the website are automatically updated. Suppliers are therefore always e-ready for any online exchange or product information requests. PAW also provides capabilities so suppliers can update their products and prices online in real time to provide buyers with more relevant information.

B. Price Research: PAW uses its online database and its offline price research capability to provide price information, intelligence and analysis. PAW has agents in North America, Asia, Middle East, Europe and South America that constantly feed into our database of suppliers. In addition, PAW works closely with its sister company ICS for offline price research. PAW offers four lines of services:

Classification/Tagging:

Private Labeling/Software Licensing:

Price Research:

Suppliers are therefore always e-ready for any online exchange or product information requests. PAW also provides capabilities so suppliers can update their products and prices online in real time to provide buyers with more relevant information.

C. Private Labeling/Software Licensing: The functionalities and features in PAW's site may be licensed to companies to manage their own supplier base and product information. Companies can attach their private label and use PAW's automated tools to classify their own suppliers using their own system with crosswalks or bridges to UNSPSC and HS codes. With this capability, companies, distributors or wholesalers can use the PAW functionality to see comparative prices from their suppliers. Suppliers will use the site to post product, price and other relevant information. More importantly, suppliers can use the site to update their information on a real-time basis.

D. Website for Price Comparison: The site provides comparative pricing in 27 categories with Featured Buyer, Featured Supplier and Featured Product sections to facilitate more information flow. Since PAW is not an exchange, but rather a price information provider, it does not have a financial interest in the transaction.

The work of PAW for their clients in correlating of the codes of UNSPSC and HS has the ability to provide more in-depth direction for future harmonization of e-commerce and taxation coding systems. Future case study work with PAW may provide a better discussion of how a structured open coding coordination system can work with a dispute settlement mechanism.

9. Conclusion

Most large organizations are quickly realizing the savings of electronic commerce and are moving quickly to utilize this channel as their primary means of exchanging information with their trading partners. All entities in the supply and demand chain - manufacturers, suppliers, distributors and sales partners - benefit from common coding standards such as the UNSPSC, which turns much of what is now raw, unintelligible data into useful, uniform information that can bring greater efficiency and focus to expenditure analysis, electronic commerce, logistics and supplier sourcing.

From an e-procurement perspective, there are two very good reasons to encourage suppliers to code according to the UNSPSC code for classifying goods and services. First, it will allow for the types of spend analysis that help sourcing organizations to rationalize their supply bases, negotiate better prices and terms with suppliers, standardize their buys across far flung operations, and compare and contrast the performance of suppliers providing similar products and services. Second, common coding schemes will make it easy for buyers to look beyond their local electronic trade exchanges, easily identifying suppliers of similar goods and services from all over the world. Care should be taken, however, that commercial – procurement/marketing - coding systems remain harmonized with taxation coding systems and that the two systems, acting in step, allow for disputes between users and authorities to be settled efficiently, in a spirit of ensuring good governance.

10. References


