What is Software? How Do We Obtain It? And What Do We Have Once We Have It?

An Assessment of Statistical Concepts, Sources and Methods

Government of Canada Expenditure Data Library (EDL) Initiative
Version 1.2

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1. Purpose

The purpose of this paper is to suggest an initial framework to describe the business arrangements by which the Canadian Government comes to hold entitlements to computer programs.¹ It may be used to structure management information about computer program expenditure by federal government decision-makers at all levels.

This task inevitably involves identifying some of the shortcomings and weaknesses in the current approaches to accounting for the various elements of computer programs obtained and held by Canada,

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³ Instead of the colloquial word “software” this paper generally uses the formal reference to “computer program” because this latter term is defined in key legislation such as the Copyright Act, and in international trade agreements.
and a consideration of how changes can be implemented in current or future administrative systems.

**Context**

Keeping track of what the government spends money and effort on, and what assets it holds entitlement to, is an important preoccupation of public servants, especially for strategic spending like information technology. Annual Government of Canada expenditure to obtain and to use computer programs is known to be in the order of several billons of dollars per year. In order for analysts, managers and executives to understand amounts and annual changes, and to be able to make sound decisions, it is essential that expenditures be categorized correctly and in a logical way.

A prerequisite for managing the federal government’s expenditures on computer programs is knowledge of what computer programs are, and the various ways by which the Government of Canada holds entitlement to them. To be effective, expenditure information should clearly identify the means by which the government obtained the works and what entitlement the government has to them. Yet it is at this most rudimentary level of expenditure categorization and data gathering which has significant flaws and shortcoming and where confusion renders our management information systems miscalibrated. It is self-evident that these flaws exist but they remain generally unaddressed.

When given a choice between flying an aircraft with instruments that are known to be randomly misleading, and flying with no instruments, a responsible pilot would choose no instruments, and use experience, perception and judgement to operate within a margin of safety. Making decisions on the basis of an information feedback system that is misleading can be worse than useless; it can be perilous.

**What is a Computer Program?**

*Or, what exactly are the elements or aspects of a computer program that the Crown in right of Canada may hold entitlement to?*

Under every country's copyright act, including Canada's, the term "literary work" explicitly "includes tables, computer programs, and compilations of literary works". The international agreements also, provide that computer programs, whether in source or object code, are to be protected as literary works under the Berne Convention (1971).

For any literary work, there are four conceptually independent things to which entitlement can be held:

1. **Instance:** One or more copies of the work in one or more media (ink & paper; digital media);
2. **Copyright Title:** Legal title to copyright/droits d'auteur on the work, which in Canada can be sold or assigned to a person or entity other than the original author;
3. **Moral Right Title:** Legal title to the moral rights/droits morales relating to the author's integrity, association and attribution, which under Canadian law can be waived but never transferred through assignment or sale;  

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6 Section 28.2(1) of Canada’s Copyright Act specifies that “the author’s right to the integrity of a work is infringed only if the work is, to the prejudice of the honour or reputation of the author” as a result of the work being
4. **A License:** Permission issued by the legal holder of copyright title, for another person or entity to make use of the work within specified terms and conditions which may include one or more of the following:
   - to install and use the work;
   - to inspect and learn from the source code;
   - to distribute instances;
   - to change the source code.

Canada comes to hold entitlement to computer program instances, copyrights, moral rights and licenses through a variety of means and mechanisms. One means of obtaining and holding entitlement to certain elements of a computer program is through the efforts of salaried employees who write and create these programs. Also the government obtains entitlement to certain elements from external sources under a diversity of specific licensing arrangements, with or without fees. Through the government procurement process, contracts are used to obtain particular elements with royalty-based licenses for the use of computer programs, as well as to retain professional services to develop, adapt and/or configure computer programs. To a growing extent, Canada also obtains copies of computer program source code, together with permissions that entitle its personnel or contractors to adapt and redistribute the code under “free/libre” terms and conditions. Further, Canada often ends up indirectly holding entitlement to computer programs through contracts that have other purposes. For example, when the government contracts to buy a piece of hardware, the hardware may come with pre-installed or embedded computer programs. Similarly, a services contractor implementing a project may put a computer program in place to run systems described in a contract, without that computer program showing up as an explicit deliverable. A variety of situations, describing how the government obtains and holds entitlement to computer programs, are summarized in Table 1.

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7 The word “hold” has the dual meaning of having and using without ownership (such as through or under a license rental agreement) or it can mean direct ownership.

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"distorted, mutilated or otherwise modified” or “used in association with a product, service, cause or institution".
Table 1. What are the elements of a computer program that the Crown in right of Canada may hold entitlement to?

<table>
<thead>
<tr>
<th>Business Context</th>
<th>Element</th>
<th>1 An Instance</th>
<th>2 Copyright Title</th>
<th>3 Moral Right Title</th>
<th>4 A License</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>To use the work</td>
<td>To install the work</td>
<td>To distribute instances of the work</td>
<td>To inspect and learn from the source code</td>
</tr>
<tr>
<td>GC employee writes a computer program</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services contractor to GC writes a computer program and retains copyright with license to GC</td>
<td>✔ X ✔</td>
<td>No (May be Waived by Title Holder)</td>
<td>✔ ✔ ✔ ✔ ✔ ✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services contractor to GC writes a computer program and assigns copyright to GC</td>
<td>✔ ✔ ✔</td>
<td>No (May be Waived by Title Holder)</td>
<td>✔ ✔ ✔ ✔ ✔ ✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier provides a computer program under a free/libre license</td>
<td>✔ X</td>
<td>No (May be Waived by Title Holder)</td>
<td>✔ ✔ ✔ ✔ ✔ ✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier commits source code to a GC-copyrighted free/libre computer program</td>
<td>✔ Yes, No or Negotiated</td>
<td>No (May be Waived by Title Holder)</td>
<td>✔ ✔ ✔ ✔ ✔ ✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lessor to GC provides a computer program under a restrictive license</td>
<td>✔ X X</td>
<td>Negotiated</td>
<td>Negotiated Negotiated (Rare) Negotiated (Rare) Negotiated (Rare)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor to GC provides hardware that comes with an untemORIZED pre-installed computer program</td>
<td>✔ X X</td>
<td></td>
<td>Unknown</td>
<td>X X X</td>
<td></td>
</tr>
<tr>
<td>Services contractor to GC provides other services that are implemented with an undocumented computer program</td>
<td>✔ X X</td>
<td></td>
<td>Unknown</td>
<td>Unknown Unknown Unknown</td>
<td></td>
</tr>
<tr>
<td>Supplier provides “software-as-a-service” to GC (Programs run on supplier's servers; Transient code may be installed by supplier on GC clients)</td>
<td>X X X</td>
<td>✔</td>
<td>X X X X X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Expenditure Data from Accounting Systems, Contracting Systems, and Human Resources Management Systems

Coding and collection of expenditure data occurs in a number of areas in the government, but three are most important. One area of expenditure data collection is in the accounting systems operated by the financial branches of departments and agencies which maintain records for the accounting function. A second is expenditure data maintained by the contracting branches of departments and agencies that record acquisitions. A third is expenditure data of the human resources branches. Each of these is discussed below.

 Attempts to undertake after-the-fact reconciliation of the three data models, each using different codes which have different categories and definitions for identifying the purpose of each expenditure, is enormously expensive, time-consuming and unlikely to result in success. Most of the costs are experienced indirectly, because when information is difficult to use, confusing, incomplete, inaccurate or uncoordinated, decision-makers are left uninformed or confused, and the coherence of decisions suffers.

3.1 Accounting System Data Relating to Computer Programs

The Accounts of Canada are maintained on the Central Financial Management and Reporting System (CFMRS) by personnel of the Receiver General of Canada. The data is assembled from summary data generated by selections from departmental records coded according to the Chart of Accounts by administrative personnel with respect to the nature or purpose of the expenditure. Summary data is maintained on an aggregate basis by the Receiver General.

The categories and their definitions of the Chart of Accounts are established by the Office of the Comptroller General of the Treasury Board Secretariat (TBS), based on standards and guidelines of the Public Sector Accounting Board, Canadian Institute of Chartered Accountants. It classifies all expenditures in four ways to:

- Identify the source of funds (usually Parliamentary votes authorize funds)
- Associate the expenditure with a particular program or departmental activity
- Identify the organizational unit which is responsible for the expenditure
- Identify the type or nature of the expenditure (The “economic object code” is intended to be the means of identifying what the expenditure is being spent on.)

Normalization of a data model is a formal, logical process of eliminating data redundancy, data overlap and data gaps. But the “economic object code” of the Chart of Accounts used by the Canadian Government has not been normalized. Even the most diligent administrative staff can be tripped up by multiple overlapping categories, and generally the coding of the type or nature of each expenditure relies upon many individuals to make interpretations about what aspects or contexts should be prioritized. Consider the following examples:

- A code in the Chart of Accounts identifies an expenditure as being for employee salaries, but there is no subcode to identify what the employee actually does or whether the

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8 Under Part VI of the Financial Administration Act "subject to regulations of the Treasury Board, the Receiver General shall cause accounts to be kept in such manner as to show the expenditures made under each appropriation". Section 63 (1) http://www.canlii.org/en/ca/laws/stat/rsc-1985-c-f-11/latest/rsc-1985-c-f-11.html
employee produces assets. Service Canada and the Office of the Human Resources (OCHRO) do make available the standards-based National Occupation Codes. These codes could be used to better identify the nature of the HR expenditure, but they are not. By default, the pay classification is used as a surrogate measure of what the employee is doing or producing. It is assumed that employees in certain pay classifications write computer programs and employees in other classifications do not write computer programs. But this is an incorrect assumption that leads to incorrect interpretations. Only a fraction of employees classified within the CS (Computer Systems) classification spend their time writing or editing computer programs, and on the other hand, there are many individuals in non-CS categories who do write computer programs (scientists, engineers and statisticians, for example).

- Codes identifying expenditures on contract personnel who may be developing computer programs are vague and cover a number of areas thus giving rise to the likelihood that the data is not accurate.9
- An administrator attempting to code an acquisition must decide whether to select the code for what something is (e.g. 1228 “Computer Software”) or how something was acquired (e.g. 0524 “Rental of Computer Software”). It is useful that the existing economic object code structure, unlike other coding systems, provides a category for the rental of computer programs. The code 0524 “Rental of Software” is described as “rental of software, including any related royalties and licenses, which require periodic payments in order to continue its use”. Unfortunately, few administrative staff understand that the purchase of licenses to use computer programs are indeed rental contracts in which copyright title rests with the supplier. It rarely occurs to them to distinguish rentals from the purchasing of copyright title to computer programs.
- There are many objects (activities) that could include computer program development, but again the definition of the code is not specific.10
- Codes which describe hardware expenditures may include hidden, embedded computer programs.11
- Associated codes, such as those maintained by Statistics Canada, add further confusion to the situation by using combined coding which does not specifically isolate computer program expenditures.12
- There are no codes to distinguish the arrangements by which GC gains entitlement to

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9 One example is object code 0472 which is “Information Technology Consultants”. This expenditure is described as, “Services acquired from suppliers through person-based contracts for computer systems management and office systems management. Such consultants provide professional services in systems analysis, design, development, programming and systems integration for business and other automated systems.” (emphasis added). Any expenditure coded 0472 may or may not include the development of a computer program.

10 One example is 0471 which is “Telecommunications Consultants”. This expenditure is described in part as, Charges for services acquired through person-based contracts for telecommunications management and engineering services. These consultants perform … engineering services such as designing, developing and implementing telecommunications equipment, systems and networks. (emphasis added) Can this include creation of a computer program?

11 One example is object code 1227, which is “Computer Equipment- Small Desktop/Personal/Portable/Keyboard”. This is described as “Acquisition of workstations, microcomputers, laptops and other portable computers, and terminals. Also included is any related peripheral equipment connected to this equipment, such as optical storage devices and any other hardware that is not included under object 1226.” There is no separate accounting of the computer program which usually accompanies such hardware.

12 For example, Statistics Canada Chart of Accounts code 1.2.4.1.07.5.05 is defined as “computers and software”
computer programs obtained under contacts or licenses, as listed in the columns of Table 1 above. Suitable codes for this purpose could, however, be based upon both Extensible Rights Markup Language (XrML) http://www.xrml.org/ and Open Digital Rights Language (ODRL) http://odrl.net/ taxonomies. It is obviously critical to distinguish whether the government is entitled only to run a computer program on a single computer with a single user, or to freely modify and redistribute the work.

- Added to the above confusion is a lack of clarity or training about whether a code should be selected for what something is, or what it is for.13

All of these issues seriously compromise the accuracy and veracity of the primary data collection, rendering it unreliable for analysts, managers and executives who later need to use it. Aggregate expenditures on computer programs have been shown to be somewhere in the order of triple the amounts reported by Treasury Board Secretariat. Coding validation by Acquisitions Branch (see section 3.2 below) of data in the Accounts of Canada for expenditures on IT Professional Services in FY2005-06 resulted in $100 million worth of transactions removed from the category, and $264 million brought it. This resulted in a net correction of $164 million. But the overall value of miscoding of $364 million within a category that totals $901 million means that the figures coded by economic object as given in the Accounts of Canada must not be used for expenditure analysis. Unless the economic object code problems are resolved and that data element is validated, this field should be removed from CFMRS to avoid misreporting and confusion.

**Recommendation:** The Office of the Comptroller General’s work on categories and definitions used in the Chart of Accounts target the development of more useful and more complete information regarding and related to computer programs (and probably other types of expenditures as well). The TBS “Accounting Standard 3.1.1 – Software” should be revised and improved to accommodate all the business arrangements by which the government comes into entitlements to computer programs.14

**Recommendation:** The Office of the Comptroller General should consider including intellectual rights metadata in the Chart of Accounts coding system, possibly based upon XrML and ODRL taxonomies.

### 3.2 Contracting Data Relating to Computer Programs

Acquisitions Branch, Public Works and Government Services Canada (PWGSC) is the common service organization which does the bulk of the procurement for Canadian government departments, however departments and agencies also do a considerable volume of lower dollar value contracting of their own for both goods and services.

When a contract is being awarded, one or more codes are applied by the contracting officer to identify the purpose of the contract and the nature of the deliverable. PWGSC uses the Goods and Services Identification Number (GSIN). The GSIN coding system, which has over 15,000 line items, or objects, is based on the United States Federal Supply Classification system which in turn is closely connected to

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13 In FY 2004-05 data, two transactions totalling $60,6140.78 were coded as “Civilian Aircraft”. But closer examination revealed that what was actually purchased were laptop computers that should have been coded as “Computer Equip small/desktop/portable”. Presumably the laptops in question were purchased as equipment for use on board federal aircraft.

14 Issues which are identified for future reviews, studies or investigations are highlighted in Italics.
the military supply system. This coding system is generally considered to be oriented towards goods, is out of date and is difficult to modify or change.

Some departments and agencies do not use the same coding system. Natural Resources Canada, for example, uses their own version of the object codes associated with the Chart of Accounts when they code their contracts. But even when the same or similar code structure is used, there is no assurance of consistency when the code structure is out of date, vague, overlapping, contains gaps and is therefore open to excessive interpretation.

The Procurement Renewal Information Management Directorate (IMD), in the Client Engagement Sector of Acquisitions Branch, PWGSC has been working with the major Financial Clusters since FY2004-05 to assist in streamlining a repeatable data quality process for goods and services acquisition data that maximizes data granularity and accuracy for client departments. Together the participating departments represent about 90 per cent of federal goods and services expenditures. In their “Spend Cube” database, data is drawn from:

- Financial System Extracts from over 50 departments
- Government-wide “Acquisition Card” Level 2 data
- Acquisitions Information System (contracts data)
- Accounts of Canada (CFMRS)
- Online Supplier Registration Information System
- Other external data

Financial records are assessed in relation to other administrative data such as contractor type, statement or work, invoice records, etc. From the original financial/accounting categories of the Chart of Accounts, and from the original contracting categories that use the Goods and Services Identification Number (GSIN), all expenditure data is reclassified according to the international standard UN Products and Services Classification (UNSPSC). The UNSPSC categories for computer programs are reproduced as Annex 2 to this report. In some cases, Acquisitions Branch further disaggregate UNSPSC standard categories. It is a practical advantage of the UNSPSC system is that specific line items can be added and modified easily, in a matter of days or weeks as opposed to years as required by a system such as in the Chart of Accounts or GSIN. In addition, there is a formal, multilateral process around the UNSPSC that facilitates collaboration in establishing codes and definitions.

The Information Management Directorate (IMD)'s “Spend Cube” work with departments provides excellent line-item detail that ensures higher reliability for analysts. It provides a repeatable, auditable process to ensure consistency and accuracy of data cleansing:

- Allows correction of miscoded transactions
  - Reconciles dept-specific field names
  - Reconciles various data types, formats
  - Maps from GSIN "line object" to Chart of Accounts "economic object"
  - Reconciles raw data inconsistencies
  - Reconciles spend totals against Accounts of Canada figures
- Provides and auditable, repeatable process
- Traces changes back to raw data
- Automates certain changes to new data

Ironically, Financial Management Directorate, Corporate Services Sector for Treasury Board Secretariat as a department has declined to participate in this validation work.
It must be acknowledged that data cleansing process never “complete”. Raw data is added quarterly, and historical data may require adjustment in light of new information.

**Recommendation:** Consideration should be given to having PWGSC and all federal organizations adopt the United Nations Standard Products and Services Code (UNSPSC) as the basis for the original coding within the Chart of Accounts, and in all acquisitions processes, to identify goods and services being obtained under contract.

**Recommendation:** In order to have greater data consistency between different coding activities, consider adopting and adapting the Chart of Accounts object codes to code procurement contracts, and consider making a formal request that the Office of the Comptroller General (and the PSAB) establish and maintain alignment of economic object coding of the Chart of Accounts with the UNSPSC standard.

**Recommendation:** A review of financial coding systems in general, and coding in relation to computer programs in particular, should be undertaken in collaboration with stakeholder organizations such as the Public Institutions Division of Statistics Canada, the Canadian Institute of Chartered Accountants, and the Canadian Society of Management Accountants.

4. A License; A Contract for Goods; A Contract for Services?

4.1 Licenses Versus Contracts

A computer program license is a permit to use, not a contract to purchase and own. It is one-way permission granted by one party for someone else to do something they otherwise would not be allowed to do. A typical end-user license agreement for restricted computer programs, such as for the Microsoft XP operating system states: "The Product is protected by copyright and other intellectual property laws and treaties. Microsoft or its suppliers own the title, copyright, and other intellectual property rights in the Product. The Product is licensed, not sold" (emphasis added). In these cases, no property ownership is acquired by the customer.

However many contracts are entered into that, among other things include the issuing of licenses. A clause may state that violation of the license will constitute breach of the contract. Still, the two are distinct types of agreement. Under a contractual relationship, each party could potentially sue the other for not living up to the terms of the contract. But a law suit related only to violation of a license would be for copyright infringement rather than breach of contract. The legal significance of this distinction is that copyright law is under federal jurisdiction, whereas contract law is a provincial jurisdiction. If a license to use a computer program is obtained through a contract, and the user violates the license, the case could be pursued as a copyright dispute, or as a contract dispute. On the other hand, if the computer program does not perform correctly, the Crown would pursue a case only through contract remedies.
4.2 Contracts for Goods, Versus Contracts for Services

When a department or agency of the Canadian Government engages an external party in a contract for the development or adaptation of a computer program (authoring or editing of computer program code), this is sometimes treated as a contract for goods, and other times as a contract for services. There are at least three reasons why PWGSC, and the government as a whole, are concerned about whether any contract is considered a contract to purchase goods, or a contract to purchase services:

- The Treasury Board Secretariat, through its contracting policy, has identified three principle classes of contracts, namely goods, services and construction. In order to know what delegated authorities apply to a particular contract, the contract must be placed into one of these three classes regardless of whether or not the contract actually fits precisely. There are no specific category for rentals, or for the provision of literary works.

- The Minister of PWGSC, by legislation, has the exclusive authority to buy all goods on behalf of the government. In general, other departments can only contract for goods if they are delegated the authority from the Minister of PWGSC. The delegation to other departments for goods contracting authority has only been $5,000, but recently this was increased for most departments to $25,000. Above this value, departments must request PWGSC to issue the goods contract on their behalf. On the other hand, departments can enter into contracts for services up to $2M. Therefore, whether a contract is considered to be a contract for goods or a contract for services makes a big difference with respect to who has what authority to process and award the contract.

- Within PWGSC itself, contracting authority varies depending on whether the contract is classified as goods, services or construction. The upper limit for PWGSC contract authority is $40M for a goods contract and $20M for a service contract. Classifying a contract for computer program licenses as a contract for goods, gives the department a much greater authority for these types of contracts.

Even computer program rentals are treated as goods contracts for approval purposes, for which the delegated authority within PWGSC is $40M. But contracts for professional services for the custom development or adaptation of programs are considered service contracts, in which case PWGSC authority is limited to $20M. Above these values Treasury Board approval is required. The process for preparing a submission to the Board to obtain approval is tedious and lengthy and is generally avoided, if possible.

The treatment of a computer program rental contract as a good, for administrative reasons, takes a conceptual step further with PWGSC’s reference to a computer program as a commodity. It is acknowledged that PWGSC uses the term commodity for many types of contracts. It is the department's way of grouping certain types of contracts together for the purposes of undertaking studies and determining and providing methods of supply. Architectural and Engineering services, security guard services, vehicles, oils and lubricants, office supplies and professional services to write computer programs, etc., etc., are all classed as “commodities” by PWGSC. Thus, contrary to

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16 Even though these authorities have been delegated to departments, departments are obliged to use mandatory standing offers for certain items which includes computer programs.

17 In a similar way contracts for printing services are considered to be goods contracts.
terminology elsewhere, a commodity at PWGSC may not in fact be a good. An asset management problem ensues when we consider contracts involving rental of literary works that come with a license as if they were goods contracts for the supply of physical assets that become fully-owned Crown assets upon delivery, while contracts for professional services to write computer programs are treated as contracts for services, and yet other programs are obtained under licenses but no contracts, as is the case with many free/libre computer programs.

Another issue, with respect to service contracts for the creation of computer programs, relates to ultimate ownership of the computer program. Normally when the government buys a good, it takes ownership of the good and title passes to Canada. However when a computer program is being created under a professional services contract, the TBS “Policy on Title to Intellectual Property Arising Under Crown Procurement Contracts” leaves, as a default, ownership of copyright with the contractor (specifically Appendix A, Part 1: “Contractor Owns”). In such cases, Canada almost always obtains a license to the work, as part of the contract. Although the default recommended by TBS is that the contractor should retain copyright, in fact most contracts for custom computer program development issued by departments are edited to have the government take ownership of the copyright, and the departments may offer licenses to the contractors. That’s to say, most federal contracting for computer program development is structured contrary to the prescribed default of the TBS policy.

Clearly, the different outcomes in terms of Crown assets need to be reflected in the coding of the contracts. As a result of a contract to develop a computer program, the code should reflect whether Canada does or does not take ownership of the copyright for the source code of the program, and if it does not have ownership, the code should indicate whether Canada does or does not have a license from the copyright holder. This information is indispensable for expenditure reporting, otherwise we cannot know what we have spent federal taxpayer’s money to obtain. Without such information, all that can be known is that a certain amount of money was spent, and that it had something or other to do with computer programs. With just a moderate amount of attention, however, it is feasible to code contracts so that appropriate, meaningful information is captured for subsequent management purposes.

The federal government coding systems currently in place are inadequate to describe the various arrangements that can be associated with contracts for computer programs.

5. The Human Dimension in the Contract Coding Function

Even if the coding system is well-structured and easy to access in order to properly and fully identify and describe the purpose of the contract, there can still be issues with contracts and licenses being poorly coded. Administrative personnel, who are the ones who generally assign the coding, may not

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19 There are approximately 50 codes which are available that relate to computer programs. It is not clear whether or not they refer to licensing arrangements. The most popular code used in PWGSC contracts is N7030 which is simply “ADP Software”. A typical example of the other codes is N7030310 which covers “Computer Software, Computer Programs, Engineering, Scientific, Mathematical, Statistical, Modeling, Simulation, Emulation, Energy - Other Than Microcomputers”. Services to develop a computer program are likely covered under D302AAP, “Informatics Professional and Consulting Services, Software Development and Implementation”. The codes are unclear and open to considerable interpretation.
understand the importance and effect of coding on downstream uses of the data for expenditure analysis. Or, these personnel might have received insufficient or incorrect instruction on how to apply certain codes in non-obvious situations. It is also possible that some administrative staff applying the codes may not be concerned about doing an accurate job of coding.

One approach to improve this situation is to provide a checklist or decision tree that contracting officers and administrative staff can use to determine the correct code to use. This does not ensure a foolproof solution but it will go some way to providing better, more reliable expenditure data. General instructions are required to help procurement staff understand why contracts need to be properly coded, how the information will be used and how to select the right codes for best classification and identification of the computer program. Also instructions and codes will need to be identified to distinguish between contracts, standing offers and call-ups as well as a means of identifying expenditures by fiscal year. Administrative staff should also be encouraged to see themselves as first-level data generators, upon which the information systems to manage government expenditure depend.

An additional semi-automated potential solution is to make use of barcodes that now come with most commercially acquired goods. If the barcodes are mapped centrally with the Chart of Accounts, and the Chart of Accounts is aligned with the UNSPSC, then the barcode reading upon delivery of any good can be used to dramatically reduce the administrative burden and accuracy issues of coding.

Given that there are severe limitations on the accuracy of contract codes, another approach has to be considered in order to make contracting data more meaningful and useful. One approach would be to instruct contractors, through their contracts, that when they invoice for work performed or goods delivered, they must break down their invoice by line item. A coding document could easily be attached to the contract for the contractor to use. The codes would equate to the Chart of Accounts object codes, providing that this is aligned with the UNSPSC. This reduces the need for administrative staff to guess or interpret the category at the time the invoice is being processed for payment, because the expenditures should be logically separated into the appropriate objects by the contractor. Care would have to be taken to not make this a burden on the contractor nor on the finance staff who process the invoice for payment. A free and efficient online automated invoicing service for all contactors to government could accommodate this efficiently.

Recommendation: A contract coding (possibly online) guide should be developed to assist contracting staff to identify and use the best code or codes available for each contract. Training for administrative staff should include an overview of federal expenditure information systems, their role in data quality control, and the importance of the role of administrative staff as first-line data suppliers.

Recommendation: Study the feasibility of mapping product barcodes with the Chart of Accounts, and aligning the Chart of Accounts with the UNSPSC, so that the barcode reading upon delivery of any good can be used to provide more accurate acquisition data to financial and contracting databases.

Recommendation: Develop a coding guideline to be used by contractors so that they can itemize their invoices by object codes which correspond to the type of information needed to properly record and account for expenditures related to computer programs. Ensure that any online automated invoicing service for all contactors to government includes functions to disaggregate and classify the elements of what has been supplied.
6. Logical Conventions in Contract Coding

A number of logical issues need to be considered when planning for coded contract information, if the intention is to restructure administrative records for more effective expenditure analysis. For example:

- Contracts often span two or more fiscal years. Contract codes do not take into account the amount of expenditure by fiscal year. All contract values are recorded in the year in which the contract is issued. Even if there was some way of coding by fiscal year the estimated values by fiscal year would be estimates only since they are projections which are provided at the time of award as opposed to the time when the expenses are actually incurred.

- Contract fees/prices, as identified at the time of the contract award, do not always equal the actual expenditure that occurs by the time the work is completed. Contract expenditures can come in under budget, for example, and usually there is no contract amendment to correct the contract amount. Use of contract data, in a case like this would overstate the actual expenditure.

- Many fee-based contracts for computer programs also bundle several other items, such as maintenance, warranties, training, financial services, and even hardware. As part of the poor coding practices in use, these contracts are usually given only one code based on the predominant item. As a result, one item becomes overstated in terms of expenditure and all the other items on that contract are understated. Even if several codes are used on a contract, it is difficult, at the start of a contract, to identify the final amounts that will be expended for each item and by fiscal year. The coding exercise becomes something of a guessing game which creates inaccurate data.

- PWGSC issues Standing Offers that are represented as contracts in the contracting data base. But these are not contracts. They are pre-negotiated arrangements with vendors for the provision of work on an “as and when required” bases, as ordered through the use of a call-up, which becomes the contract. The call-ups/contracts are usually issued directly by various government departments. The contract data would be in their data bases. But PWGSC also places call ups against standing offers. Since the standing offers are in the database and since call-ups appear as separate contracts there is a real possibility that there may be double counting of contract information and data.

7. Issues with the Logical Coherence of Accounting Standards and Guidelines

Review of the Accounting Treatment of Software as Tangible Capital in PSAB’s Tangible Capital Assets “Statement of Principles” Sections .028-.032

Beginning in 2001 the Canadian Institute of Chartered Accountants (CICA), and its Public Sector Accounting Board (PSAB) have allowed the treatment of all spending on computer programs as tangible capital expenditure for accounting purposes, including whether in the form of rentals, contracted development, or own-account development. This practice (a) may be inconsistent with predominant industry practice; (b) may inadvertently lead to errors through the capitalization of rentals; (c) may conflict with related legislation and trade agreements; and, (d) may allow terms of contract to inappropriately determine accounting treatment. These issues result in highly inconsistent interpretations of accounting rules, with the result that business cases, competitive proposals, and
budgetary decisions in this field are not correctly informed about relative or absolute costs.

7.1 Inconsistent with Predominant Industry Accounting Practice

Accounting for computer program expenditure as tangible capital assets has always been a controversial rule, and recently, Professor Charles Mulford and Jack Roberts at the Georgia Institute of Technology (reference below) analyzed how the capitalization of computer program expenditure by firms causes financial reports to significantly overstate earnings for the fiscal year in which the money is spent, and then through amortization, to cause earnings to be understated in subsequent years. Finding that the majority of computer program development companies, in fact, do not capitalize computer program spending, and that amongst firms where it is done, the methods are arbitrary, they recommend that accounting standards bodies should revoke the provisions that permit this practice. Their study is in reference to the US market, however the issue they discuss is not significantly different in Canada.

Mulford and Roberts\textsuperscript{20} propose that computer program development costs should be returned to the pre-2001 treatment as research and development, which is expensed. Such a step “would be more closely aligned with the realities of the computer program industry today”. Similarly, employee contributions to a computer program project should be shown either as operations/maintenance expenditures (e.g. bug fixes), or as research and development investment (e.g. new capabilities), which may in part depend upon the organization's accounting policies.

It was noted above that under the Copyright Act and international trade agreements to which Canada is a signatory, the term literary work “includes tables, computer programs, and compilations of literary works”. The question then arises: Does the OCG permit the capitalize of other literary works? Even if scientific articles in journals, and policy papers in organizations might be considered to become less valuable over time (which itself would be debatable), there is no provision for capitalizing the expenditures on the scientists and policy personnel who write these works.

7.2 Inconsistent with Predominant Authoring Practices for Computer Programs

There is a second way that treating computer programs as capital is inconsistent with predominant industry practice. For example, Section 2 of "Treasury Board Accounting Standard, 3.1.1 - Software" http://www.tbs-sct.gc.ca/pubs_pol/dcgpubs/accstd/sof-log1_e.asp#_Toc510341908 which is modelled on PSAB standards, leads off with the statement: “There are three basic stages to an information technology project”. The text proceeds to describe the discredited "waterfall approach" to computer program development. But the computer program world is mainly characterized by modular, agile methods. Computer programs evolve through refactoring, derivative works, porting (i.e. translating to different languages/platforms) and distributed modularization (autonomously-created plug-ins). Value is in the knowledge and the market relationships they embody, not in the source code per se. Furthermore, well done "old code", or even just the manuals for old applications typically serve as valuable documentation for new systems. While innovation in a field advances, good computer program content (for example the reference implementations of the Internet Protocol Suite such as “the

TCP/IP Stack”) do not die, they just get updated. Quality computer programs do not “wear out” the way physical assets do.

7.3 Terms of Contract

The current PSAB standard is sometimes interpreted by organizations as requiring the capitalization of expenditure for computer program work carried out under "IT Professional Services" contracts. Yet the same organizations typically do not capitalize computer program creation, adaptation or maintenance when the work is done by salaried employees. Whether or not contracted and salaried development expenditure is capitalized usually depends on how it was coded by particular administrative staff. The current approach too easily leads to the implementation of two different accounting rules at the same time for the same substantive work.

Recommendation: CIOB, EMS and OCG at TBS should re-assess whether the treatment of computer program expenditure as tangible capital expenditure: (a) is consistent with predominant industry practice; (b) may inadvertently lead to errors through the capitalization of rentals; (c) conflicts with related legislation and trade agreements; and, (d) allows contract terms to inappropriately determine accounting treatment.

The PSAB should review the scope of “tangible capital assets”, and consider explicitly excluding computer programs. It should initiate work on accounting rules to accommodate computer programs in a manner consistent with all other works governed by the Copyright Act.

Annex 2 to this report is a draft “Development of a Prospectus for a Standard/Guideline on Full Cost/Benefit Accounting for Information Technology Systems” that IT Services Branch of Public Works and Government Services Canada contracted to Michael Tinkler, CA, CMC, FCMA in 2005. The suggested work has not been undertaken, and yet it remains absolutely essential if the Canadian Government intends to have coherent information technology expenditure information upon which to make decisions.

8. Summary of Recommendations, Suggested Investigations and Further Studies

The current system for recording expenditures related to Canada’s holding of entitlement to computer programs is inadequate to collect and record accurate, meaningful information. At present it is not possible to report information that is helpful towards understanding the government’s actual involvement in and possession of computer programs.

The following steps could be taken to correct the situation:

Recommendation: Consideration should be given to whether contracts involving the four elements of computer programs could be classified as something other than goods or services contracts, or at least if a sub classification could be put in place for “literary works” which would provide consistency with federal law and international trade agreements, and greater clarity and consistency in analysis.

Recommendation: Future reviews should focus on the definitions and the categories used in the Chart
of Accounts in order to provide more useful and more complete information regarding computer programs (and probably other types of expenditures as well). Such a review should include a consideration of identifying salary expenditures that are related to computer program development and ‘free/libre, computer program improvements, upgrades, etc.

**Recommendation**: A review could be undertaken of the Statistics Canada and other coding systems in order to identifying better information that could be obtained from those systems and to exert influence in order to modify the codes for improved data identification and linkage to the Chart of Accounts. (the Stats Can codes are updated every few years, for example, although their coding of computer programs is also inconsistent)

**Recommendation**: Consider adopting and adapting the Chart of Accounts object codes to code procurement contracts, and align the Chart of Accounts with the UNSPSC standard coding system.

**Recommendation**: A contract coding guide should be developed to assist contracting staff to identify and use the best code or codes available for each contract.

**Recommendation**: Develop a coding guideline to be used by contractors so that they can itemize their invoices by object codes which correspond to the type of information needed to properly record and account for expenditures related to computer programs. In the case of ‘free/libre’ a computer program being provided under contract in the form of a generic license, a consistent methodology will be required.
Annex 1
This document was prepared under contract to the Information Technology Services Branch, PWGSC in 2005.

Development of a Prospectus for a Standard/Guideline on Full Cost/Benefit Accounting for Information Technology Systems

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Objective
The objective of this project is the development of a business case for a standard or guideline to properly account for the full costs and benefits of the development and operation of information technology systems, including hardware and software, over their entire life cycle, along with a strategic analysis of the process for bringing such a standard or guideline into existence.

This report summarizes the work done.

Methodology
The methodology for this project included the following steps:

- Familiarization with work already done in this area in the Canadian federal government and in other public and private sector organizations;

- Contacts with the Society of Management Accountants of Canada, the Canadian Institute of Chartered Accountants and the International Federation of Accountants to identify their processes for developing standards and guidelines and to do an initial assessment of their interest in a standard or guideline on full cost accounting for information technology systems;

- Contacts with Treasury Board (CIO Branch and the Office of the Comptroller General);

- Contacts with private sector sources to identify their interests and concerns;

- Preparation of a business case for the development of a standard or guideline that would identify the needs of various stakeholders, outline the issues that a standard or guideline would have to address, identify the resources required and present a development plan.

- Development of a strategic analysis of the process required to have one or more of the standard-setting bodies participate in or undertake the development of a standard or guideline.

- Coordination of the work with related project.

Existing Standards and Guidelines

Canadian Federal Government Standards
Existing relevant standards are Treasury Board Accounting Standards 3.1, Capital Assets and 3.1.1 – Software. Neither of these addresses the full costs and benefits of the development and operation of information technology systems.

**Canadian Standard-Setting Bodies**

**The Canadian Institute of Chartered Accountants**

Their focus is on accounting and reporting to external stakeholders of the organization, rather than on management reporting and decision-making.

The relevant committees are the Accounting Standards Board and the Public Sector Accounting Board. A search of their published standards and studies revealed nothing specific on the costs and benefits of IT systems. However, the sections of the CICA Handbook on asset valuation, on which TBAS 3.1 and 3.1.1 are based, set out the same general principals (laid-down historical cost, amortization, bundling, etc.)

**The Society of Management Accountants of Canada**

Their focus is much more on strategic management and decision-making and less on external reporting.

While they do not have a permanent standard-setting committee, they are the pre-eminent body in the world in the development of management accounting standards and have two sets of pronouncements:

- Management Accounting Standards
- Strategic Management Accounting Practices

However, these existing standards contain nothing on the costs and benefits of IT systems.

**The American Institute of Certified Public Accountants and the Financial Accounting Standards Board**

A preliminary search of their websites yielded no relevant information.

**The International Federation of Accountants**

They have management and public sector standards, but no published standards relevant to accounting for information technology projects in particular. It does however publish the “IFAC Handbook of International Information Technology Guidelines”

http://www.ifac.org/Store/Category.tmpl?Category=Information%20Technology

- Security
- Business Impact
- Acquisition
- Implementation
- Service Delivery and Support
- Monitoring

**The International Accounting Standards Board**

They focus on standards for external reporting, but here again nothing that is relevant. They are similar to the CICA and the AICPA in that there primary focus is public accounting and external
financial reporting.

**Literature Search**

A preliminary search of the literature via the Internet yielded no references to a vendor-independent standard or guideline for IT cost-benefit accounting. A more rigorous search will be required using a literature database.

**Contacts with Standard-Setting Bodies**

**Society of Management Accountants of Canada**

They have been contacted (CEO and VP Research) and are interested in participating in development of a business case for this.

**Canadian Institute of Chartered Accountants**

David Smith, the CEO, will be contacted after a preliminary call from the CEO of CMA-Canada. However, early indications are that they would not likely be interested in developing a standard at this time. While there may be external financial reporting implications in connection with information technology systems, the CICA is currently focusing its standard-setting efforts on more pressing problems for them, such as the need to firm up accounting standards in the wake of the recent corporate accounting scandals and a concerted effort that is being made by the members of IFAC to develop a harmonized set of international accounting standards.

**International Federation of Accountants**

The Canadian representatives on the two key committees (Bob Dye and Rick Neville) are both well known to the present author, and will be engaged at the appropriate time. Once CMA participation is established, Bob Dye, a former CEO of CMA Canada and CMA Canada’s current representative on the IFAC committee that deals with management accounting, will be in a position to make a case for the development of a standard.

**Contacts with the Treasury Board Secretariat**

- CIO Branch
- Office of the Comptroller General

**Business Case Outline**

In order to influence the various standard-setting bodies to undertake the development of a standard, it will be necessary to prepare a business case or proposal to them. The following paragraphs provide a detailed outline of this business case.

**Stakeholders’ needs**

Who are the stakeholders? Managers, suppliers, shareholders and taxpayers all need to have a decision-making and valuation standard for IT assets. There are internal management reporting and decision-making needs and external accountability needs.
Financial accounting standards currently promulgated by bodies such as the CICA, the AICPA and IASB include provisions for the valuation of assets, including information technology hardware and software, that stipulate that these assets be shown at their full laid-down cost. This means that all expenses incurred to render the asset fully operational are included in the cost of the asset. Treasury Board Accounting Standards, which are based on CICA standards, also provide for this. What is less clear is whether expenditures for a collaborative or open-source initiative would be capitalized as assets, since the expenditure would not lead to the acquisition of an asset. (Generally accepted accounting principles define an asset as something that is owned, whose value can be measured and that will provide future benefits to the organization.)

By the same token, the benefits received by participation in a collaborative or open-source initiative (for example, the receipt of enhanced versions of the software at no cost to the organization would be difficult to record as revenues because of the difficulty in establishing an objective measure of their value.

From a decision-making point of view, it is critical that all costs and benefits be considered. The costs are generally easier to calculate than the benefits, but the challenge here is that many decisions are based on an incomplete cost picture. The costs are generally relatively straightforward, using an approach such as total cost of ownership, even though they may include a certain level of forecasting uncertainty. The benefits are more difficult to quantify, but a standard in this area would at least provide a framework for presenting these benefits, along with guidelines for their estimation.
Issues to be addressed

A standard would have to address a specific set of issues. Questions need to be develope with stakeholders, such as:

1. What are the full costs and benefits that need to be taken into account in IT investment and acquisition decisions?
2. How can the less tangible assets and costs and benefits (cost avoidance, opportunity costs, intellectual capital, etc.) be valued? Etc.

Resources required

The resources required on the part of the federal government would not be extensive in the short term. Each standard-setting body who agreed to develop a standard in this area would have to commit some level of resources to the effort. Given that they may already have commitments to current standard-setting projects, they may not be willing to commit such resources in the short term.

Development planning

Standard-setting is a lengthy process and can take at least two to three years. Thus, it is important to develop a formal proposal to one or more of the above bodies and submit it as soon as possible.

Strategic Analysis

The strategy that seems to make the most sense is to work through CMA-Canada and through them to the CICA and IFAC. CMA-Canada is the most logical starting point, as they have the highest level of interest in this area and are currently in the process of increasing their involvement in the area of research and standard-setting. Once they are engaged, the next logical approach would be to IFAC, since CMA Canada has frequently played a leadership role there in the past. While the CICA should be approached, it may be unlikely that they would participate, given their current priorities. However CICA will be consulted as appropriate.

On the government side, the CIOB and the Comptrollership Branch could participate directly in the development of a policy or guideline. The Comptrollership Branch may be interested in a collaborative effort with CMA-Canada, since the two organizations are already working together on another initiative. CIOB and Comptrollership Branch can also provide liaison with other governments.

Conclusion

The need for a standard in this area is evident, and it is highly likely that one or more standard-setting bodies would be interested. Given the long lead-time for standards development and promulgation, it is important that the process be initiated at the earliest possible date.
Annex 2
UN Products and Services Classification (UNSPSC)

Categories For Software (Computer Programs)
http://www.unspsc.org/search.asp [Search code 4323]

43230000  Software
        43231500  Business function specific software
            43231501  Helpdesk or call center software
            43231503  Procurement software
            43231505  Human resources software
            43231506  Materials requirements planning logistics and supply chain software
            43231507  Project management software
            43231508  Inventory management software
            43231509  Bar coding software
            43231510  Label making software
            43231511  Expert system software
            43231512  License management software
            43231513  Office suite software
            43231514  Sales and marketing software
        43231600  Finance accounting and enterprise resource planning ERP software
            43231601  Accounting software
            43231602  Enterprise resource planning ERP software
            43231603  Tax preparation software
            43231604  Financial analysis software
            43231605  Time accounting software
        43232000  Computer game or entertainment software
            43232001  Action games
            43232002  Adventure games
            43232003  Sports games
            43232004  Family software
            43232005  Music or sound editing software
        43232100  Content authoring and editing software
            43232101  Pattern design software
            43232102  Graphics or photo imaging software
            43232103  Video creation and editing software
            43232104  Word processing software
            43232105  Charting software
            43232106  Presentation software
            43232107  Web page creation and editing software
            43232108  Calendar and scheduling software
            43232110  Spreadsheet software
            43232111  Optical character reader OCR or scanning software
            43232112  Desktop publishing software
        43232200  Content management software
            43232201  Content workflow software
            43232202  Document management software
            43232203  File versioning software
            43232204  Embedded text entry software
            43232205  Fonts software
        43232300  Data management and query software
            43232301  Categorization or classification software
            43232302  Clustering software
Customer relationship management CRM software
Data base management system software
Data base reporting software
Data base user interface and query software
Data mining software
Information retrieval or search software
Metadata management software
Object oriented data base management software
Portal server software
Transaction server software

Development software
Configuration management software
Development environment software
Enterprise application integration software
Graphical user interface development software
Object or component oriented development software
Program testing software
Requirements analysis and system architecture software
Web platform development software
Compiler and decompiler software

Educational or reference software
Foreign language software
Computer based training software
Spell checkers
Route navigation software
Multi-media educational software
Encyclopedia software
Dictionary software
Phonebook software

Industry specific software
Aviation ground support software
Aviation test software
Facilities management software
Computer aided design CAD software
Analytical or scientific software
Compliance software
Flight control software
Industrial control software
Library software
Medical software
Point of sale POS software
Computer aided manufacturing CAM software
Manufacturing execution system MES software

Network applications software
Application server software
Desktop communications software
Interactive voice response software
Internet directory services software
Internet browser software

Network management software
Network monitoring software
Network operating system enhancement software
Optical network management software
Administration software
Internet protocol IP multimedia subsystem software
43232900  Networking software
   43232901  Access software
   43232902  Communications server software
   43232903  Contact center software
   43232904  Fax software
   43232905  LAN software
   43232906  Multiplexer software
   43232907  Storage networking software
   43232908  Switch or router software
   43232909  WAN switching software and firmware
   43232910  Wireless software
   43232911  Network connectivity terminal emulation software
   43232912  Gateway software
   43232913  Bridge software
   43232914  Modem software
   43232915  Platform interconnectivity software
   43232916  Infrared data transfer irda software
43233000  Operating environment software
   43233001  Filesystem software
   43233002  Network operation system software
   43233004  Operating system software
   43233005  Computer firmware
43233200  Security and protection software
   43233201  Authentication server software
   43233203  Network security or virtual private network VPN management software
   43233204  Network security and virtual private network VPN equipment software
   43233205  Transaction security and virus protection software
43233400  Utility and device driver software
   43233401  Compact disc CD server software
   43233402  Data conversion software
   43233403  Data compression software
   43233404  Compact disc CD or DVD or sound card software
   43233405  Device drivers or system software
   43233406  Ethernet driver software
   43233407  Graphics card driver software
   43233410  Printer driver software
   43233411  Screen saver software
   43233413  Voice recognition software
   43233414  Storage media loading software
   43233415  Backup or archival software
   43233416  Codec stacks
   43233417  Handwriting recognition software components
   43233418  Memory drivers
   43233419  Multimedia stacks
   43233420  Text to speech conversion software
   43233421  Video drivers
43233500  Information exchange software
   43233501  Electronic mail software
   43233502  Video conferencing software
   43233503  Network conferencing software
   43233504  Instant messaging software
   43233505  Ambient music or advertising messaging software
   43233506  Map creation software
   43233507  Mobile operator specific standard software
   43233508  Mobile operator specific application software
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<td>Mobile internet services software</td>
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<tr>
<td>4323511</td>
<td>Mobile location based services software</td>
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<tr>
<td>4323512</td>
<td>Ring tone software</td>
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<tr>
<td><strong>4323600</strong></td>
<td><strong>Electrical Equipment software</strong></td>
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<td>4323601</td>
<td>Motor Drive Software</td>
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<td>Power Monitor Software</td>
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<td>Programmable Logic Control Software</td>
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