

# Defining the B.C. High Technology Sector

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PREPARED BY BC STATS – 2023



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# 1. How was the sector definition derived?

## 1.1. Background

In 1995, BC Stats and the Science and Technology Division of the Ministry of Employment and Investment developed a definition of the high technology sector that focused on standard industries that produce high technology goods and services as their ultimate outputs. The definition looked at the high technology outputs of various standard industries (industries defined in the Canadian Standard Industrial Classification—SIC), their level of research activity, their representation in existing lists of high technology companies, and the opinions of an expert panel drawn from government, university, and the private sector.<sup>1</sup> The SIC data series has since been discontinued and the North American Industry Classification System (NAICS) has been implemented in its place.

The adoption of NAICS-based industry definitions made it necessary to revisit the definition on which the high technology estimates were based, since many of the industry groupings previously used were no longer available. During 2001, in consultation with industry stakeholders, BC Stats developed a new definition of the high technology sector using NAICS industry categories. The process of developing the criteria for including or excluding specific industries in the definition was similar to that of the original SIC-based definition as commodity lists, research activities, and company lists were once again examined. In addition, since an accepted SIC-based definition was already available, a SIC to NAICS concordance was used as a starting point.<sup>2</sup>

The definition originally chosen (based on theoretical considerations) proved to be only a starting point, as much of the information required to compile high technology statistics was

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<sup>1</sup> The complete methodology is presented in Lawrance, J. and Miller, S. [Defining the British Columbia High Technology/Knowledge Sector](#). (1996). BC Stats, Ministry of Government Services, and Ministry of Employment and Investment, Government of British Columbia.

<sup>2</sup> A more detailed discussion of the methodology is presented in Miller, S. and Adams, S. [Defining the British Columbia High Technology Sector Using NAICS](#). (2001). BC Stats, Ministry of Management Services, Government of British Columbia.

not available at the required level of detail. A working definition, based on the availability of data, was adopted to prepare the estimates published.

In 2005, that definition was expanded further to include various communications technologies. The new industries added to the existing definition were determined through a review of literature pertaining to high technology definitions in use elsewhere, particularly those from the American Electronics Association (whose definition has been widely used by institutions around the world) and Industry Canada.<sup>3</sup> The definition has been further updated to incorporate NAICS changes. Every five years NAICS is revised to reflect the emergence of new or expanded industries and often this includes industries in the realm of high technology.

## 1.2. Are all high technology companies included?

It is recognized that there are some drawbacks to the industry-based definition employed here, where all firms and employment in the high technology NAICS-based industries are included. The first is that NAICS does not fully recognize newer and emerging industries. As a result, new products and services are often grouped into an existing industry that primarily produces similar but distinctly different products and services.

Second, it is difficult to capture the full breadth of high technology or knowledge-intensive activity in the economy through NAICS-based definitions. Innovation is not unique to a specific group of industries, rather it can be found throughout the whole economy. Some industry leaders will be missed if they are classified in industries that, in aggregate, fail to show high technology characteristics. On the other hand, it is impossible to remove those firms that lag behind the norm in an industry.

The industries included in the definition adopted represent the core of the high technology sector. While it is certainly true that examples of creativity and innovation can be found in every industry, this definition, with its industry focus, includes only those industries where high technology activity is concentrated.

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<sup>3</sup> Platzer, M., Novak, C.A. and Kazmierczak, M.F. (February 2003). *Defining the High-Tech Industry*. American Electronics Association.

E. Wayne Clendenning & Associates (May 2000). *Comparison and Reconciliation of SIC and NAICS Industry Codes Used to Define Knowledge-Based Industries (KBIs)*. Industry Canada.

## 1.3. Exactly which industries are included?

The following table lists the industries that constitute the high technology sector. High technology manufacturing and services are grouped, and services are further subdivided below. All industries are based on the NAICS Canada 2017 Version 3.0. In the future, data will reflect any changes stemming from NAICS Canada 2022 Version 1.0.

### INDUSTRIES IN THE HIGH TECHNOLOGY SECTOR

NAICS	Industry Description
<b>Manufacturing Industries</b>	
325189	Other Basic Inorganic Chemicals
325410	Pharmaceutical and Medicine
333310	Commercial and Service Industry
334110	Computer and Peripheral
334210	Telephone Apparatus
334220	Radio, Television Broadcasting & Wireless Communications Equipment
334290	Other Communications Equipment
334310	Audio and Video Equipment
334410	Semiconductor and Other Electronic Components
334511	Navigational and Guidance Instruments
334512	Measuring, Medical and Controlling Devices
334610	Manufacturing and Reproducing Magnetic and Optical Media
335315	Switchgear and Switchboard, and Relay and Industrial Control Apparatus
335920	Communication and Energy Wire and Cable
335990	All Other Electrical Equipment and Component
336410	Aerospace Products and Parts
339110	Medical Equipment and Supplies
<b>Service Industries</b>	
<b><i>Motion picture production &amp; post-production</i></b>	
512110	Motion Picture and Video Production
512190	Post-Production and Other Motion Picture and Video Industries
<b><i>Telecommunications</i></b>	
515210	Pay and Specialty Television
517310	Wired and Wireless Telecommunications Carriers (except Satellite)
517410	Satellite Telecommunications
517911	Telecommunications Resellers
517919	All Other Telecommunications
<b><i>Engineering services</i></b>	
541330	Engineering
<b><i>Software publishing</i></b>	
511211	Software Publishers (Except Video Game Publishers)

511212 Video Game Publishers

***Other computer and related services***

518210 Data Processing, Hosting and Related Services

519130 Internet Broadcasting, and Web Search Portals

541514 Computer Systems Design and Related (Except Video Game Design and Development)

541515 Video Game Design and Development Services

***Other services***

541360 Geophysical Surveying and Mapping Services

541370 Surveying and Mapping (Except Geophysical) Services

541380 Testing Laboratories

541620 Environmental Consulting

541690 Other Scientific and Technical Consulting

541710 Research and Development in Physical, Engineering and Life Sciences

541720 Research and Development in the Social Sciences and Humanities

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## 1.4. High Technology Industries

### Manufacturing

#### **325189 Other Basic Inorganic Chemicals**

Comprises establishments engaged in the manufacture of high technology inorganic chemicals such as enriched uranium and radioactive isotopes.

#### **325410 Pharmaceuticals and Medicine**

Consists of firms engaged in the manufacture of drugs, medicines and related products for human or animal use, including cutting edge products developed through considerable research efforts.

#### **333310 Commercial and Service Industry Machinery**

Contains establishments that manufacture machinery for use in commercial and service industries, including high technology optical instruments and photographic equipment.

#### **334110 Computers and Peripheral Equipment**

Comprises establishments primarily engaged in the manufacture of computers and peripheral computer equipment such as storage devices, CD-ROM and DVD drives, optical readers and scanners, etc.

### **334210 Telephone Apparatus**

Contains firms that manufacture wired telephone and data communications equipment, including cordless telephones, facsimile equipment, local area network (LAN) equipment, etc.

### **334220 Radio and Television Broadcasting and Wireless Communications Equipment**

Consists of firms primarily engaged in manufacturing radio and television broadcast and wireless communications equipment, including satellites, GPS (global positioning system) and pagers.

### **334290 Other Communications Equipment**

Comprises establishments engaged in the manufacture of other types of communications equipment, such as traffic signals, fire detection and alarm systems, remote control units, intercom systems, etc.

### **334310 Audio and Visual Equipment**

Establishments engaged in manufacturing electronic audio and video equipment such as compact disc and DVD players, televisions, etc.

### **334410 Semiconductor and Other Electronic Components**

Consists of firms engaged in the manufacture of semiconductor devices and other electronic components such as circuit boards, microprocessor chips and other computer parts, fibre-optic connectors, etc.

### **334511 Navigational and Guidance Instruments**

Comprises establishments primarily engaged in navigational and guidance instruments such as air traffic control radar systems, sonar, etc.

### **334512 Measuring, Medical and Controlling Devices**

Establishments engaged mainly in the manufacture of equipment such as high technology medical devices, laboratory analytical and testing instruments, industrial process control instruments, etc.

### **334610 Manufacturing and Reproducing Magnetic and Optical Media**

Contains establishments primarily engaged in manufacturing magnetic and optical media such as compact discs, computer software, etc.

### **335315 Switchgear and Switchboard, and Relay and Industrial Control Apparatus**

Comprises establishments engaged in manufacturing electrical switchgear and protective equipment, including high technology switching devices.

### **335920 Communication and Energy Wire and Cable**

Consists of firms engaged in the manufacture of communications and energy wire and cable such as high technology fibre-optic cable.

### **335990 All Other Electrical Equipment and Components**

Comprises establishments engaged in manufacturing electrical equipment and components, including fuel cells.

### **336410 Aerospace Products and Parts**

Establishments engaged in manufacturing aircraft, missiles, space vehicles, etc.

### **339110 Medical Equipment and Supplies**

Contains firms that manufacture medical equipment and supplies, including high technology laboratory and dental equipment.

## **Services**

### **511211 Software Publishers (Except Video Game Publishers)**

Establishments engaged in producing and distributing computer software, not including video games.

### **511212 Video Game Publishers**

Establishments engaged in producing and distributing video games.

### **512110 Motion Picture and Video Production**

Comprises firms engaged in producing motion pictures, videos, television programs and commercials.

### **512190 Post-Production and Other Motion Picture and Video Industries**

Consists of establishments engaged in providing post-production services and services to the motion picture and video industries, including high technology special effects and animation.

### **515210 Pay and Specialty Television**

Establishments engaged in broadcasting television programs on specialty cable networks, pay television or satellite networks.

### **517310 Wired and Wireless Telecommunications Carriers (Except Satellite)**

Consists of establishments engaged in providing telecommunications and video entertainment services either to customers' homes or to mobile devices over network facilities they operate.

### **517410 Satellite Telecommunications**

Contains firms engaged in operating and maintaining satellite telecommunications facilities.

### **517911 Telecommunications Resellers**

Comprises establishments primarily engaged in providing telecommunications and/or video entertainment services over network facilities operated by others.

### **517919 All Other Telecommunications**

Comprises establishments primarily engaged in providing operating telecommunications networks or providing telecommunication services not elsewhere classified.

### **518210 Data Processing, Hosting and Related**

Consists of firms engaged in providing hosting or data processing services.

### **519130 Internet Broadcasting and Web Search Portals**

Comprises firms primarily engaged in broadcasting content on the Internet, or in operating web search portals.

### **541330 Engineering**

Comprises establishments engaged in engineering activities in design, development and utilization of machines, instruments, systems, etc.

### **541360 Geophysical Surveying and Mapping Services**

Establishments engaged in gathering, interpreting and mapping geophysical data.



### **541370 Surveying and Mapping (Except Geophysical) Services**

Contains firms engaged in providing surveying and mapping services of the surface of the earth, including the sea floor.

### **541380 Testing Laboratories**

Consists of establishments engaged in providing physical, chemical and other analytical testing services.

### **541514 Computer Systems Design and Related (Except Video Game Design and Development)**

Establishments that provide expertise in the field of information technologies through writing and supporting computer software, and computer systems design and maintenance, with the exception of video games.

### **541515 Video Game Design and Development**

Establishments primarily engaged in designing and developing video games without publishing them.

### **541620 Environmental Consulting**

Comprises establishments primarily engaged in providing consulting services on environmental issues, using a staff of scientists, engineers and other technicians.

### **541690 Other Scientific and Technical Consulting**

Consists of firms engaged in providing advice and assistance on scientific and technical issues (other than environmental issues).

### **541710 and 541720 Scientific Research and Development**

Establishments engaged in research and experimental development in areas such as biotechnology, computers, physics, mathematics, etc.

## 2. Defining High Technology Commodities

### 2.1. Defining high technology commodities

Developing a definitive list of what commodities should be considered high technology is a difficult exercise. Leading technologies are continually evolving and what is considered high technology today may be classified as low tech tomorrow. As a result, the definition of high technology commodities must necessarily change over time. This means that data regarding high technology trade from 2009 may contain commodities that are no longer included in the 2020 definition. However, this does not mean that the data cannot be compared over time. It is still valid to look at growth rates over that period as long as it is clear that the rates represent growth in the changing definition of high technology, rather than a static basket of goods.<sup>4</sup>

The commodity list used by BC Stats to define high technology goods is based on the U.S. Bureau of the Census' Advanced Technology Products (ATP) list.<sup>5</sup> To be considered advanced technology, a commodity code has to meet certain criteria. It must contain products whose technology is from a recognized high technology field, the products must represent the leading edge of that field and comprise a significant portion of all goods in the classification code.

The list of American commodity codes from the ATP list was matched against the equivalent Canadian codes. In many cases, the codes matched exactly and no further effort was needed. However, in other cases there was not an exact match, particularly for exports, which are coded to only eight digits. For these commodity groups, further analysis was undertaken using available data from the U.S. Bureau of the Census and Statistics Canada to determine whether

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<sup>4</sup> A technical limitation that may cause difficulty in temporal comparisons is when there are changes to the definition of Harmonized System codes. When this occurs, there may be a resulting unintended change to the high technology commodity definition. This is because the code may now include or exclude commodities that it did not previously, such that these goods can no longer be separated out (or perhaps can be more finely defined, so that low technology commodities that previously had to be included can now be expunged from the definition). However, these changes are usually small and should not have a significant impact on the data.

<sup>5</sup> For a discussion of the development and content of this list, see: McGuckin, R. H., Abbott, T. A., Herrick, P. and Norfolk, L. (1991). *Measuring Advanced-Technology Products Trade: A New Approach*. U.S. Bureau of the Census.

the majority of these codes were high technology (as defined by the ATP list). If it was judged that this was not the case, the commodity was excluded from the high technology definition. While this may result in some high technology products being excluded from the definition, it should be balanced to some extent by those commodity classifications that, although they are mainly high technology, still include some low tech goods. Since the ATP list itself is defined using classification codes, this kind of trade-off is already present in the definition. No exact measure of high technology trade is possible to achieve since what comprises high technology is subjective, but this definition should be in line with what most people would agree is high technology.

Note that a commodity need not be produced by one of the industries included in the industry-based high technology definition to be considered a high technology product. Some industries not included in the high technology definition, because they mainly manufacture low technology goods, may also manufacture some high technology products. Conversely, it is possible for those industries classified as high technology to also manufacture some products that are considered low tech.

## **2.2. Calculating B.C. consumed imports**

At this time, Statistics Canada does not produce data on imports by province of consumption, rather, only by province of clearance. An estimate of B.C. consumed imports was derived using the consumption of Canadian imports of those commodities by the B.C. economy and applying this ratio to total Canadian imports.

## **2.3. Data source**

Data for trade in goods is supplied by Statistics Canada and the U. S. Bureau of the Census.

## **2.4. Commodity groups**

The U.S. Bureau of the Census has defined ten fields involving advanced or high technology commodities. Each field represents a large number of products and processes that are considered to be on the leading edge. These fields have been used to classify exports and imports in this report.

## **Aerospace**

Technological developments in this field include advances that allow planes to fly further, faster, higher, to use less fuel, and to have quieter engines. Many of the advances have been adapted to military applications, such as vertical take-off aircraft and aircraft that require shorter distances for takeoff and landings.

## **Biotechnology**

Biotechnology covers recent developments in recombinant deoxyribonucleic acid (DNA) research and genetic engineering. Obvious examples include drugs, enzymes, and other therapeutic items. Common applications include agricultural production and the use of microorganisms to produce drugs and other complex molecules.

## **Computer and Telecommunications**

This field covers technological advances affecting both computers and telecommunications hardware products. The primary advances in this field are in developing hardware that can process information more quickly. Important breakthroughs are expected in the areas of artificial intelligence and parallel processing.

## **Computer Integrated Manufacturing**

This field includes developments in robotics and numerically controlled (NC) machines. These products have a significant impact on industrial automation. Robots and NC machines perform increasingly sophisticated operations through developments in the sensory and visual capabilities of machines. With these breakthroughs, the manufacturing processes have increased in flexibility and require less human intervention to operate and maintain production machinery. Many of the new automation technologies are made possible because of breakthroughs in the application and development of faster, smaller components.

## **Electronics**

The miniaturization of electronic components is the most important recent technological advancement in the field of electronics. Some technologies include integrated circuits; semiconductors, such as transistors and diodes; and new developments in surface mounting of electronic components, such as capacitors and resistors.

## **Life Sciences (Medical)**

This field encompasses the application of scientific advances to medical sciences. Nuclear resonance imaging, echo cardiographs and total-patient monitoring systems are examples of products developed from recent technological advances in this field. Also, recent increases in the strength of materials and reductions in their weight have led to improved internally-implemented fixation devices and prostheses.

## **Materials Design**

Materials design includes the newest methods of production for products that already exist in the market as well as the development of new products. Recent examples of technological advancements include high temperature superconductors, advanced polymers that expand the areas of plastic use, and new ultra-clear glass that allows fibre-optic cable to be used for long distance communication.

## **Nuclear Technology**

This field covers developments in nuclear power production and primary nuclear reactors. It includes newly designed reactor components that improve the safety and efficiency of nuclear power plants. It also includes developments in the creation and packaging of nuclear fuel, and the application of atomic physics to other areas of science.

## **Opto-Electronics**

Opto-electronics is generally defined as the expanded development and application of the laser. Also included are recent advances in photoelectric cells and diodes, photographic and other imaging equipment, and fibre-optic cables.

## **Weapons**

This field covers all advanced methods used for the development, guidance, and control of weapons intended for national or personal protection and deterrence. Many of the developments in this area are the result of breakthroughs in computers and telecommunications as well as aerospace technologies.

# 3. Defining International Trade in High Technology Services

International imports and exports of high technology services are defined by BC Stats as including the following Supply-Use Product Classification (SUPC) codes:

- 353 MPS511200 General purpose software
- 355 MPS5121A2 Movie, television program and video production, post-production and editing services
- 364 MPS517001 Fixed telecommunications services (except Internet access)
- 365 MPS517002 Mobile telecommunications services
- 366 MPS517003 Cable, satellite and other program distribution services
- 367 MPS517004 Fixed Internet access services
- 368 MPS518000 Data processing, hosting, and related services
- 369 MPS519001 Subscriptions for online content
- 370 MPS519002 Internet advertising
- 405 MPS541300 Architectural, engineering and related services
- 407 MPS541501 Custom software design and development services
- 408 IMS541502 Own-account software design and development services
- 409 MPS541503 Computer systems design and related services (except software development)
- 410 MPS541600 Management, scientific and technical consulting services
- 411 MPS541701 Research and development services
- 412 IMS541702 Own-account research and development (except software development)



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