

# Information and Communication Technology: Durham Region

## Definition and Context

According to the Canadian Information and Communication Technology Council, ICT includes goods and services that process, transmit or received information. These are technologies related to software, hardware, computer services, telecommunications, microelectronics etc. ICT is prevalent in e-commerce, e-learning, e-health, wireless multimedia and digital entertainment, in addition to emerging technologies such artificial intelligence. ICT sector in Canada encompasses services, manufacturing, wholesale, rental and leasing. (ICTC, 2008) This all-encompassing use of ICT in multiple sectors is what the Government of Canada refers to as the *Digital Technologies* sector, and include vertical markets developing in healthcare, education, finance, defence and the creative industries as IT based systems form the basis of essential operations in an economy. However, given the novelty of the system as well as the unregulated nature of the industry, the best available data source of capturing digital technologies remains the ICT subsector. (Government of Canada , 2018) Under the NAICS system, the ICT subsector is cross industrial and contains manufacturing, wholesale, retail<sup>1</sup> and services.

In Ontario, the ICT sector contributes approximately 272,000 jobs and provides \$ 26.7 billion to Ontario's GDP and \$ 14.1 billion in exports to the provincial economy. The provincial government has selected ICT to be a priority component of healthcare, government service provision, energy & environment and business improvement. (Ministry of Economic, Development. Job Creation and Trade , 2018)

## Durham Region ICT Sector

ICT has the potential to be a growth sector for Durham Region. Durham Region has multi-fold advantages in positioning itself to be a technological hub close to Toronto, even more as the economy transitions into a knowledge based one. Durham Region is home to some of the fastest rising businesses and start-up in Greater Toronto Area (GTA), more importantly, the rise of tech-based companies are as prominent in the Township of Scugog as they are in the City of Oshawa; for example, *360 Incentives* in Whitby provides software technology services to three million users globally whereas *Scarsin 12E* in Uxbridge provides businesses support with best practice forecasting.

In Durham Region ICT strategies at the municipal level are more evolved compared to the existing regional ICT strategy. For example, Town of Whitby has formulated a broadband strategy and the City of Oshawa is a participant in the federally implemented *Smart Cities Challenge*, however, a Regional level strategy to tie the municipal strategies is unavailable.

## ICT Investment in Durham Region

ICT investment is measured as a share of GDP in order to assess the level of investment of each comparator region relative to the size of its economy. In Canada, Ontario, New Brunswick and Alberta are top performing provinces for investment. However, in a ranking of ICT investment among peer countries, Ontario receives a 'C' in ICT investment. ICT investment not only focus on innovative businesses but also on software, equipment and on human resources. (Conference Board of Canada, 2018)

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<sup>1</sup> ICT retail consists of the six- digit NAICS 443144 - Computer and software stores, however, the boarder category 4431 electronic & appliance stores may not be representative of the actual employment/industry size and thus ICT retail is excluded in employment calculations for Durham Region.

In Durham Region an exact measurement of ICT investment in relation to GDP is not conducted, however, over the past years substantial funds have been allocated toward ICT in particular.

**The Durham Region Innovation Hub** is conceived as an opportunity to strengthen local technology and entrepreneurial environment. DRI-Hub is expected to be a vehicle supporting technology development and product and services commercialisation. Currently DRI-Hub is planned to be built in the City of Oshawa and will have a hub-and-spoke model with a full-service anchor facility in Oshawa with the primary spoke in Whitby and secondary spokes in municipalities. A feasibility study on the design and scope of the innovation hub is concurrently being conducted with C\$ 10,000 committed from the City of Oshawa Development Services 2018 operating budget.

The Town of Whitby, in partnership with 360 insights is creating the **Whitby Innovation Hub-Accelerator (Wi-HUB)** as a space for innovation and commercialisation with the potential to bring together various resources to aid new and early-stage tech companies. (Town of Whitby, 2017) The estimated cost of the proposed landscape plan for the site is \$254,316.40. (Town of Whitby, 2018)

Durham Region focuses substantively on supporting businesses to conduct their operations in an increasingly digital world. **Spark Centre**, a provincially designed organisation, is created to support Durham Region and Northumberland Country to provide technical and advisory support to innovation start-ups. **Digital Durham** also helps Durham Region mainstream businesses in their efforts to adopt new technologies.

In addition, there are limited private sector initiatives focused on younger students. Organisations such as **Tech Sparks** has its own programs with the Durham District School Board to educate young, black tech professionals in Ajax schools. (Rattan, 2018)

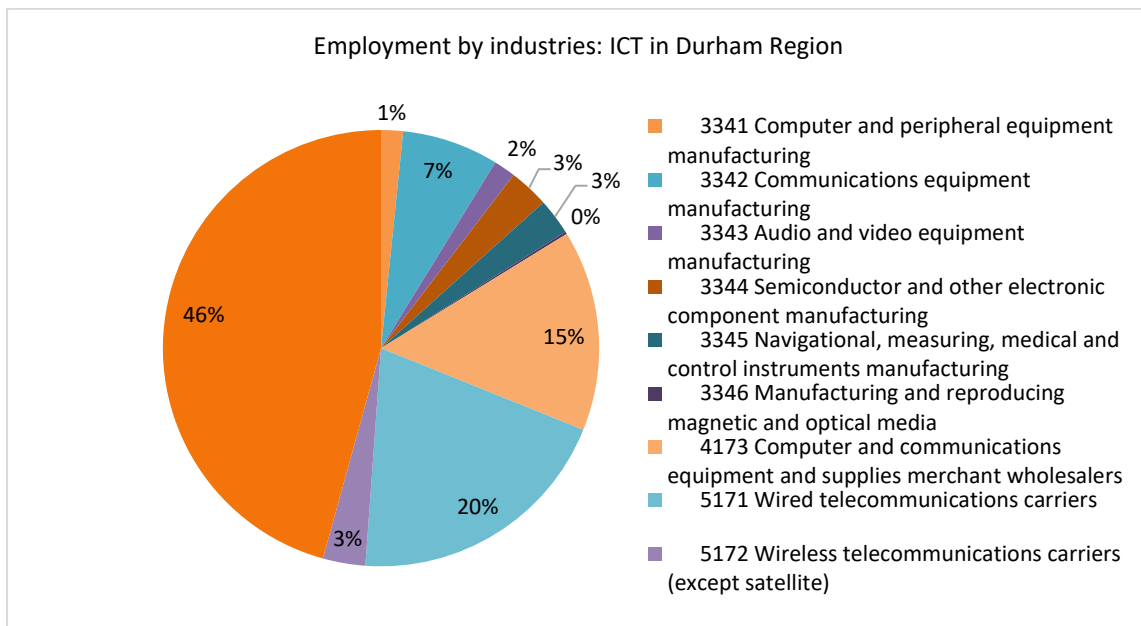
## Durham Region ICT Employment

ICT is an evolving sector in Durham Region, and due to the multiple use of technology, ICT subsector spreads across different industries and thus, the NAICS<sup>2</sup> system of industry classification used to outline the ICT sector includes subsectors from manufacturing, such as *NAICS 3341 Computer and peripheral equipment manufacturing*; services, such as *NAICS 5415 Computer Systems Design & related services*; and wholesale industries, such as *NAICS 4173 Computer communications and equipment supplies* etc. While the industry classification may be unable to provide the exact figures of ICT sector employment, it provides the best estimate of how many people work in ICT in Durham Region with current available data. All numbers are provided on the basis of *Place of Work* estimation, i.e., employees who work in Durham Region, to avoid conflation with employees who may reside in Durham Region but are employed in Toronto, which is a Canadian ICT Hub.

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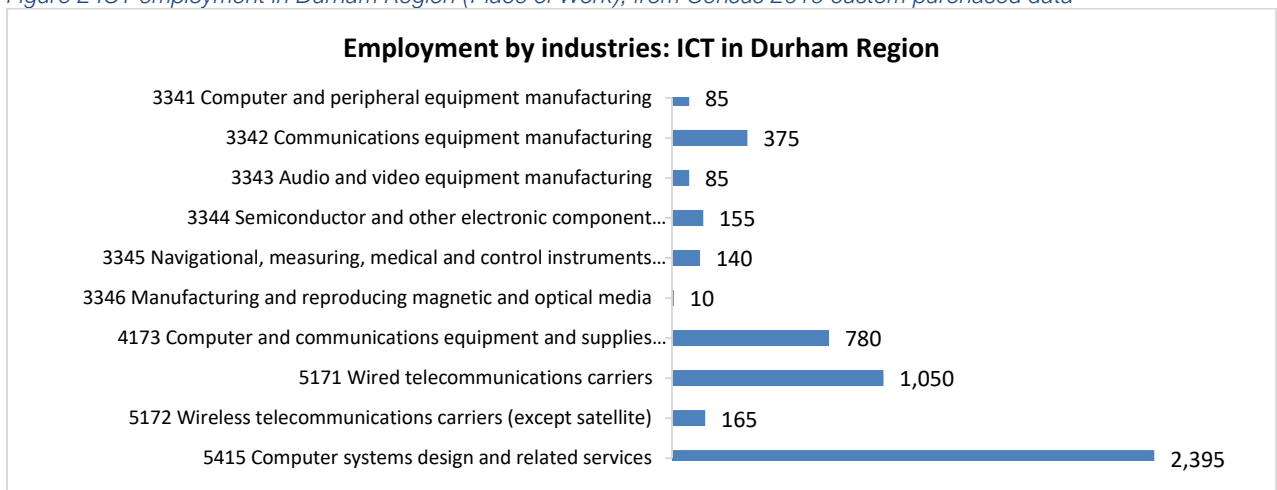
<sup>2</sup> The North American Industry Classification System (NAICS) is a hierarchical classification system for industries, developed by the national statistical agencies of Canada, United States and Mexico. (Statistics Canada, 2017). This classification system divides the economy into 20 major sectors grouped by production criterion, which are further divided into 102 sub-sectors and 324 industry groups (Statistics Canada, 2017). To know more about NAICS please visit <http://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=307532>

Figure 1 Durham Region ICT employment by sub- sectors (Place of Work); from Census 2016 custom purchased data



The above chart presents the sub-industry employment information by contribution of each sub-industry to the entire industry. It shows *Wireless telecommunications carriers* comprises of nearly half of the employment in the ICT industry in Durham Region. Durham Region has a variety of wireless telecommunications carriers including Bell, Rogers and Koodo<sup>3</sup>. The second largest sub-industry by employment are the *Wired telecommunication carriers* contributing to one-fifth of the employment. Wireless telecommunication carriers such as Bell and Rogers also provide wired telecommunications services such as broadband connections etc.

Figure 2 ICT employment in Durham Region (Place of Work); from Census 2016 custom purchased data



The figure above presents total employment in ICT subsectors in Durham Region in 2016. Census 2016 showed 5,240 employees worked in Durham Region in the selected ICT subsectors. Almost 46 percent of the employees (2,395) worked in NAICS 5415 *Computer systems design and related services* subsector, making it the largest ICT subsector in terms of employment. The second largest subsector is NAICS 5171 *Wired telecommunication carriers service* with 1,050 employees and 20 percent of employment. There are 10 employees who work in the

<sup>3</sup> <http://www.choosewhitby.ca/en/advantagewhitby/telecommunications.asp>

*Manufacturing and reproducing of magnetic and optical media* subsector, which includes the production of CDs, DVDs and other mass storage devices.

## Top ICT Occupations in Durham Region

There are more than 6,000 occupations in the Canada National Occupational Classification (NOC)<sup>4</sup> system. ICT occupations can range from purely technical, i.e., *NOC 2147 Computer engineers*, to largely sales oriented, i.e., *NOC 6421 Retail salespersons*. The occupations selected in the chart below are the top 15 four-digit occupations in Durham Region based on the ICT subsectors (four-digit NAICS) chosen above.

*Table 1 Top 15 ICT occupations in Durham Region; from Census 2016 custom purchased data*

Rank	Occupations	Total employed
1	2171 Information systems analysts and consultants	725
2	6552 Other customer and information services representatives	400
3	2174 Computer programmers and interactive media developers	315
4	0213 Computer and information systems managers	255
5	6221 Technical sales specialists - wholesale trade	230
6	0131 Telecommunication carriers managers	155
7	2281 Computer network technicians	135
8	6421 Retail salespersons	125
9	9523 Electronics assemblers, fabricators, inspectors and testers	120
10	2242 Electronic service technicians (household and business equipment)	115
11	2282 User support technicians	115
12	2175 Web designers and developers	100
13	2147 Computer engineers (except software engineers and designers)	90
14	2173 Software engineers and designers	90
15	0013 Senior managers - financial, communications and other business services	85

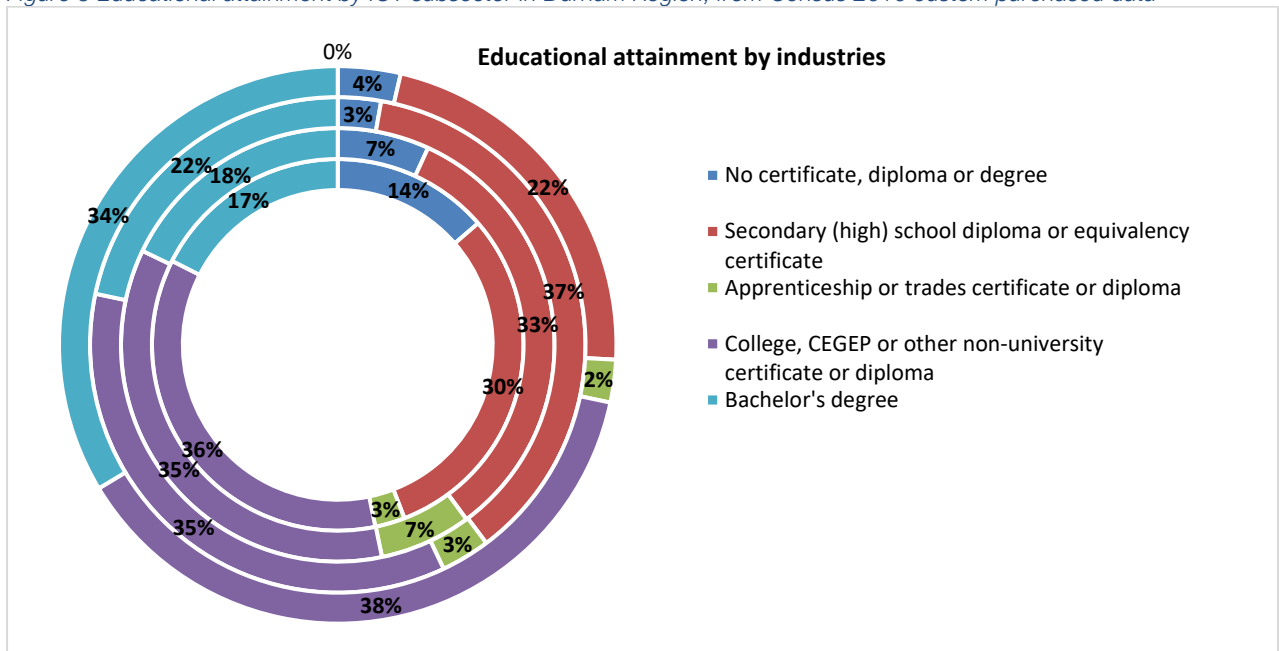
The table above describes in top 15 occupations the ICT subsectors in Durham Region. There are 3,055 people employed in the top ICT occupations. The discrepancy between the occupation and the industry indicate the while the occupations are ICT based, the employees may be working in other industries such as manufacturing, healthcare etc. *NOC 2171 Information systems analysts and consultants* ranks at the top among the ICT occupations in Durham Region, with 725 employees. There is a large gap between the top two occupations with *NOC 6552 Other customer and information services representatives* ranking at the second place with 400 employees. There are 315 *Computer programmers and interactive media developers* and 255 *Computer and information systems manager* in Durham Region.

## Educational Attainment in Durham Region ICT

With an increasingly knowledge-based economy, information on educational attainment provides a useful idea about the labour force needs and requirement for the industry and occupation. For the ICT industry, data at the four-digit NAICS level are not available at the regional level, thus three-digit subsector data presents an estimation of the educational attainment.

<sup>4</sup> The National Occupational Classification System (NOCs) is developed by the government of Canada, as the Canadian standardized taxonomy and framework for communicating about labour market information, and is sorted by skill levels and skill types (Government of Canada, 2018x). Occupations within this taxonomy are grouped by the type of work required for each job, including the employment requirements, job description and responsibilities, tasks and duties (Government of Canada, 2018x).

Figure 3 Educational attainment by ICT subsector in Durham Region; from Census 2016 custom purchased data



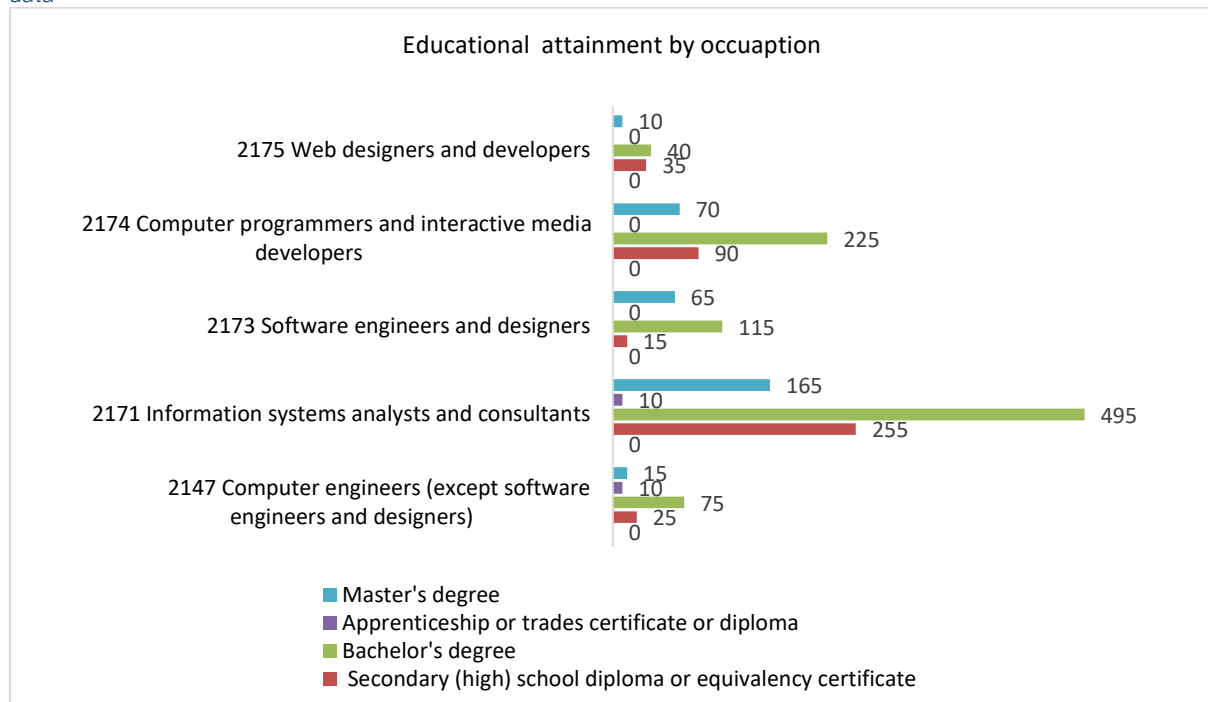
The chart above shows the proportion of employees with different educational attainment in the subsectors 334 Computer and electronic product manufacturing (inner-most circle), 417 Machinery, equipment and supplies merchant wholesalers (second line from the centre), 517 Telecommunications (second line from the top), 541 Professional, scientific and technical services (outermost circle). More than 50 percent of employees in each of the subsectors either have a college diploma or a bachelor's degree, indicating the need for specialised knowledge to carry out the functions needed in these industries.

Table 2 Education by ICT sub-industries; from 2016 Census custom purchased data

Industry	Total - Highest certificate, diploma or degree	No certificate, diploma or degree	Secondary (high) school diploma or equivalency certificate	Apprenticeship or trades certificate or diploma	College, CEGEP or other non-university certificate or diploma	Bachelor's degree	Master's degree	Earned doctorate
334 Computer and electronic product manufacturing	840	105	235	20	275	135	35	0
417 Machinery, equipment and supplies merchant wholesalers	1835	115	555	115	595	300	65	0
517 Telecommunications	1375	35	460	40	440	270	40	0
541 Professional, scientific and technical services	12130	375	2290	255	3925	3465	985	95

## Education by Occupation

Figure 4 Educational attainment by selected ICT occupations in Durham Region; from Census 2016 custom purchased data



The chart above looks at five ICT non-managerial occupations in Durham Region and the educational attainment of the employees. It is clear that the majority of the employees have at least a Bachelor's degree in each of the occupations. Additionally, these occupations also have substantive participation from people with secondary school diploma or equivalent certificate. While there are very few employees with an apprenticeship, nearly 20 percent of employees in these occupations have a Master's degree.

Table 3 Educational attainment by selected ICT occupations in Durham Region; from Census 2016 custom purchased data<sup>5</sup>

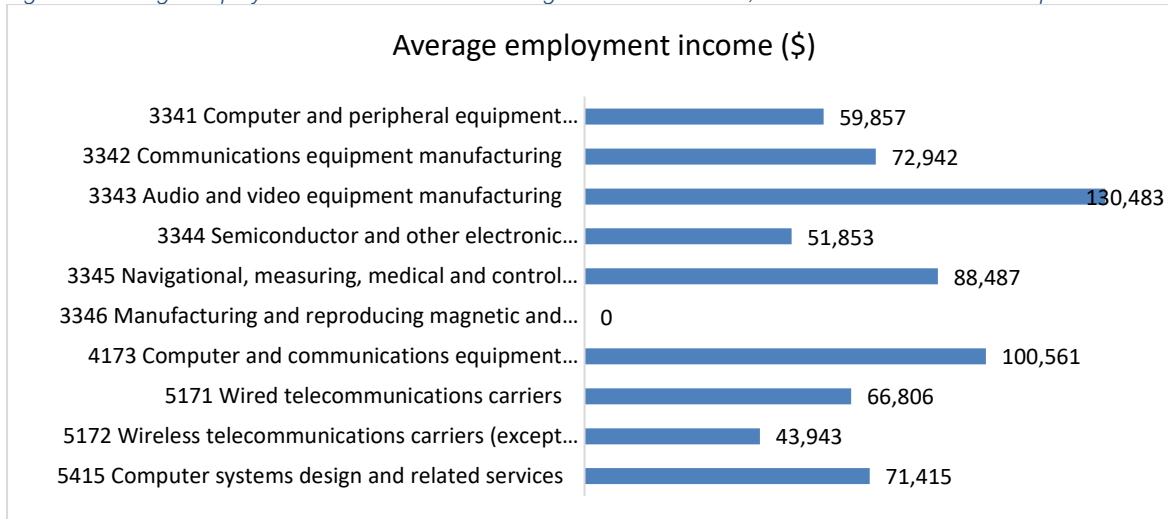
Occupations	Total - Highest certificate, diploma or degree	No certificate, diploma or degree	Secondary (high) school diploma or equivalency certificate	Apprenticeship or trades certificate or diploma	College, CEGEP or other non-university certificate or diploma	Bachelor's degree	Master's degree	Earned doctorate
0013 Senior managers - financial, communications and other business services	460	20	110	10	120	90	65	0
0131 Telecommunication carriers managers	190	10	50	0	65	45	0	0
0213 Computer and information systems managers	555	25	90	10	175	145	75	0
2147 Computer engineers (except software engineers and designers)	190	0	25	10	55	75	15	0
2171 Information systems analysts and consultants	1565	0	255	10	550	495	165	10
2173 Software engineers and designers	290	0	15	0	65	115	65	15
2174 Computer programmers and interactive media developers	600	0	90	0	195	225	70	0
2175 Web designers and developers	225	0	35	0	145	40	10	0

### Employment Income in Durham Region ICT

Average employment income in Durham Region (by industry) in 2016 was \$ 50, 161. Given the comparatively higher level of educational attainment of employees in the ICT industries, employment income for these employees are expected to be higher than average.

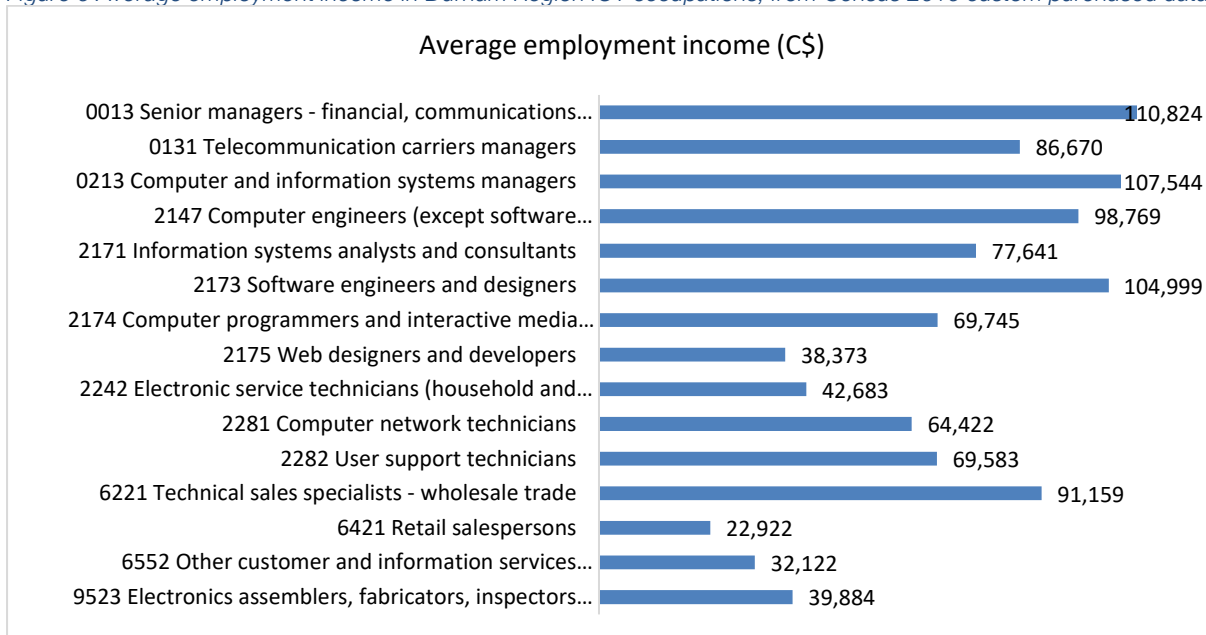
<sup>5</sup> A zero may mean there is no employee with the degree in question, but it may also mean data is suppressed by Statistics Canada due to reasons of privacy

Figure 5 Average employment income in Durham Region ICT subsectors; from Census 2016 custom purchased data



The chart above lists the average employment income in the ICT subsectors in Durham Region, and most ICT subsectors generally pay at a higher rate compared to other industries. NAICS 3343 *Audio and video equipment manufacturing* pays the highest average income at C\$ 130,483, followed by NAICS 4173 *Computer & communications equipment and supplies* at C\$100,561. Employees in NAICS 5172 *Wireless communication carriers* earn the lowest average income at C\$ 43, 943. The data for NAICS 3346 *Manufacturing and reproducing magnetic and optical devices* are likely suppressed due to the low number of employees in this sub sector.

Figure 6 Average employment income in Durham Region ICT occupations; from Census 2016 custom purchased data



The chart above shows the average employment income in the top 15 occupations in ICT. Among the non-managerial positions, NOC 2173 *Software engineers* earn the highest average employment income at C\$ 104,999, followed by NOC 2147 *Computer engineers* at C\$ 98,767. NOC 6421 *Retail salespersons* earn the lowest annual average employment income at C\$ 22,922 since the sales position does not necessitate specialised or technical skills, education or knowledge, compared to the other occupations in this sector. Overall, the level of employment income is higher for a managerial positions, followed by positions in engineering. Employment income is lower when occupations are less specialised.



## ICT Education in Durham Region

Durham Region is gradually establishing itself to be a resource for ICT education. The University of Ontario Institute of Technology and Durham College both focus on ICT related degrees and Trent Durham also provides a number of IT related Bachelor's degrees. Currently, the top three higher-educational institutes in the Region provide the following credentials at or below bachelor level:

Institution	Degree
Trent Durham	BA/BCS in Computing Systems
University of Ontario Institute of Technology	BSC/ BSCM Computer Science Bachelor of Software Engineering Bachelor of Information Technology (Honours)
Durham College	Ontario College Diploma: Computer Foundations Computer Programmer Computer Programmer Analyst Computer Systems Technician Computer System Technology Information Systems Security

### Key Performance Indicators: Durham College

Each year, Durham College produces a Graduate Employment Report based on information compiled from the KPI survey. The information contained in the report profiles the employment status of Durham College graduates from post-secondary programs in 2016. Six months after graduation, graduates are contacted by an independent consulting firm (hired by the Ministry of Training, Colleges and Universities), regarding their employment status. The table below represents programs within the ICT sector

*Table 4 Durham College Graduate Employment Report Fall 2017*

Program Name	Total Graduates	Percentage Working (Related occupation)	Percentage Working (total)
Computer Programmer	6	0	0
Computer Programmer Analyst (CPA)	33	71	71
Computer Systems Technician	24	60	70
Computer Systems Technology	25	60	70
Information Systems Security	27	67	67

### Key Performance Indicators: UOIT

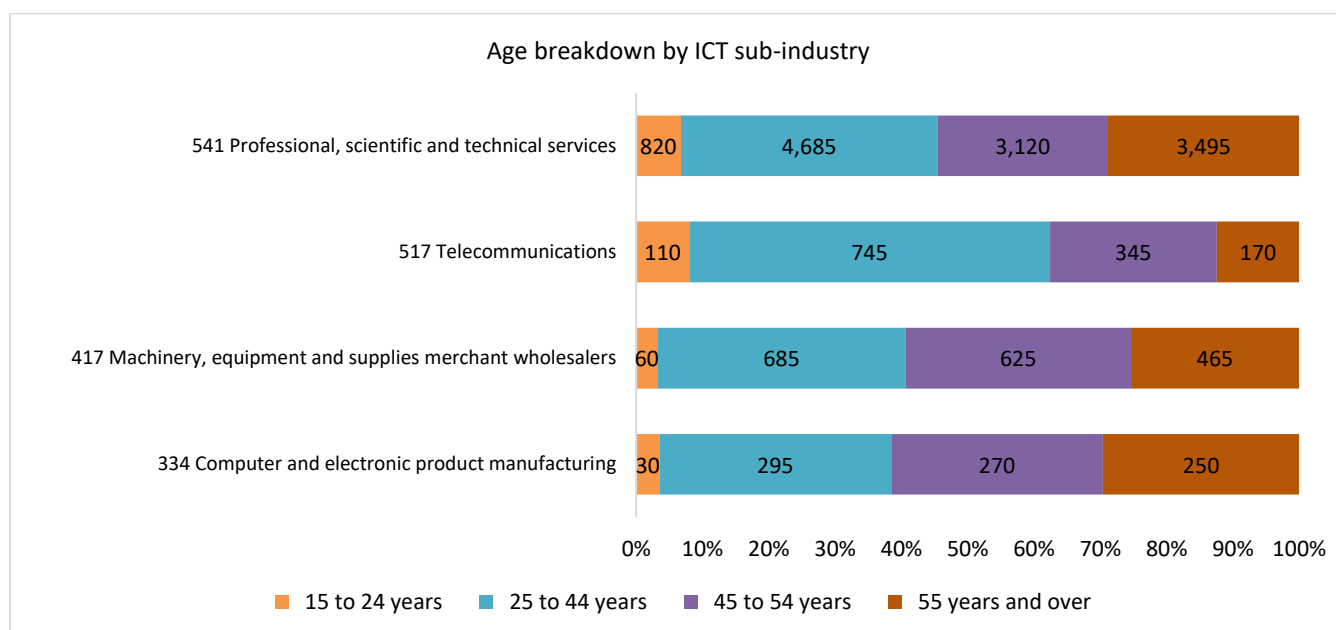
UOIT is also responsible for publishing Key Performance Indicators for undergraduate programs, including employment rates 6 months and 2 years following graduation. Although there is less detail than the Durham College KPI data, the indicators still provide a basic understanding of what programs of study are related to higher employment. The table below represents programs within the ICT sector, and is the most recent publicly available data, for graduates from 2014.

Table 5 Graduation, Employment, and COISL Loan Default Rates: UOIT, 2015-2016

Program	Graduation rate	Employment Rate (6 Months)	Employment Rate (2 Years)
Computer Science	51.4	91.3	93.6
Engineering	63.6	78.4	90.3

In the ICT sector UOIT only provides information on broader topics and not by programs, and the graduate employment rate is the number of graduates of bachelors or first professional degree programs expressed as a percentage of labour force after graduation. (UOIT, 2018)

### Workforce Age Breakdowns



The chart above gives an age-breakdown in ICT sub-industries (by three-digit NOCs only), and for these sub-sectors, the primary working-age group is ages 25-44 years. This is highest in telecommunications where nearly 60 percent of employees are in this age group. Employees who are 24 or under generally form less than 10 percent of the employee composition in each of the sub-sectors.

### ICT Growth in Durham Region

Census data shows that in terms of employment in Durham Region, ICT sector has experienced limited growth. Employment in Durham Region in 2016 grew to 5,240 from 5,225 in 2011. This is a growth of .29 percent. Durham Region is ideally placed to connect and take advantage of the ICT Hub of Toronto. The availability of educational opportunities in the sector within the Region implies that further growth potential in forthcoming, especially if it is accompanied by appropriate ICT investment and infrastructure throughout Durham Region.

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