



# City of Oshawa

Sector Analysis + Cluster Development Strategy

December 2, 2013



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# 1 Executive Summary

As with the rest of the Greater Toronto Area, Oshawa is expected to continue growing by population and employment over the next 20 years. The city remains the eastern gateway to the GTA, and will continue to be one of the key urban areas in Durham Region, accommodating a strong mix of population and employment growth to 2031. However, recent economic development trends internal and external to the City are reshaping the characteristics of that growth. Where it was once recognized as “Canada’s Automotive Capital”, post-secondary education and health care assets have generated notable growth in more knowledge-based and service-oriented industries different from traditional strengths over the last several years.

Just as demographic and economic trends forced the restructuring of traditional industries and emergence of new opportunities, those same trends provide the City’s economic development office with the opportunity to present new areas of focus, and new initiatives and programs that respond to those new opportunities. The Target Sector Analysis and Cluster Development Strategy provides the necessary background information for the City to identify existing and emerging areas of opportunity, and build the density of businesses, talent, and inter-connected support structures needed to support these more sustainable sources of growth.

## Structure of the Report

The approach employed in the strategy included background review of existing policies and strategies, industry sector and labour force trend analysis, and stakeholder consultations. The structure of the report is as follows:

- **Section 2** provides an overview of the strategy’s objectives, and the approach used to assess target sectors and strategic directions
- **Section 3** provides an overview of the labour force and industry analysis completed to evaluate existing sectors of focus in the City from previous work, and identify new and emerging areas of opportunity
- **Section 4** provides detailed profiles of Oshawa’s five target sectors, including recent labour force and business trends, and the structure of their value chain



- **Section 5** provides an overview of the key strengths, weaknesses, opportunities, and threats for Oshawa and its target sectors emerging from stakeholder input and background review
- **Section 6** provides strategic directions on the development of economic clusters, and an action plan focused on supporting business and job growth in Oshawa's five key sectors

## Key Findings and Strategic Directions

The sector focus for Oshawa established in 2008 built on a strong mixture of capabilities and assets in both traditional areas of strength for the City and Region, and emerging areas of opportunity based on sector convergence, information technology, and existing support structures. The new sectors of focus for Oshawa build on that premise, but reorganize the target sectors to be more reflective of the economic, demographic, and industry trends that have acted on the City since 2008. The five target sectors for Oshawa include:

- Advanced manufacturing
- Health and biosciences
- Energy generation
- Multimodal transportation and logistics
- Information technology

Within each of these sectors the strategy identifies niche subsector opportunities for the City, as well as the overall strategic focus for the development of a cluster around those opportunities. A number of key themes emerged from the target sector analysis to guide that strategic focus:

- Sector opportunities in Oshawa are potentially transformative
- Research and development capacity in the City is a growth driver
- Educational programming is a considerable strength
- Key synergies between all sectors supports convergence
- Firms supporting business process improvement offer a platform for IT growth
- Corporate and research assets support local technology innovation prospects
- Local companies maintain connections with global and emerging markets
- Advanced manufacturing companies have diversified
- Communications campaigns are needed to promote Oshawa's hidden gems



Building on those themes, the cross-sectoral and sector-specific initiatives outlined in the action plan are intended to support the achievement of a number of opportunities for the City in each sector.

- **Advanced manufacturing:** Oshawa becomes a leader and Centre of Excellence in advanced manufacturing, with UOIT and Durham College acting as anchors to support a diverse base of technology-driven manufacturing companies
- **Health and biosciences:** Oshawa becomes a growing and innovative suburban health and biosciences cluster built on the strengths of Lakeridge Health and emerging research capacity
- **Energy generation:** Oshawa emerges as a key provincial energy generation cluster with the diversity to match the provincial energy generation mix, and research and corporate capabilities in sustainable energy, manufacturing, and professional services that make it a Centre of Excellence for advanced manufacturing and energy
- **Multimodal transportation and logistics:** Oshawa becomes an integrated regional logistics and distribution hub working in tandem with the activities of larger centres in the GTA, and a critical component in the regional supply chain that enables economic development across Durham Region
- **Information technology:** Oshawa's information technology sector becomes a strong enabler that facilitates the growth of other business sectors through the continued adoption and deployment of key technologies, supported by the entrepreneurial and talent development infrastructure at UOIT and Durham College

The most successful frameworks for supporting cluster development are community-based, with the ability to draw on the expertise and connections of other organizations internal and external to the community to achieve the vision for development. However, they must also be reflective of the resources available to implement the strategy, and realistic in their assessment of priorities and timelines required for achieving positive results. The development of a cluster requires notable levels of support and resources coordinated across a number of organizations, so it is critical that prospects be viewed within the context of a longer term strategy, especially in new areas of opportunity.

As a result, the cluster development strategy recommends potential partners among the range of businesses, educational institutions, and sector-specific and government organizations that can assist with the growth of target sectors in Oshawa. Further, it provides direction on the prioritization of the action and the timeframe over which the City and its economic development partners may need to focus on the action to achieve the intended results. Understanding that effective strategies



measure their success, each set of actions is assigned a set of key performance indicators or metrics as well.

Given the broad nature of cluster development activities, it is essential that the cluster development strategy be viewed as a starting point for Oshawa to engage with other partners. Though the actions contained in the strategy are meant to inform the annual business planning activities of Oshawa Economic Development Services, they act as a framework for organizing support and aligning with external strategies and resources. Only through engagement and coordination can Oshawa develop the full range of talent, infrastructure, financial capital, and enabling policies and programs needed to support cluster development in key sectors.



## 2 Introduction

The City of Oshawa is the largest municipality in Durham Region, and is considered the eastern gateway to the Greater Toronto Area. Over recent years, the City has experienced significant population growth, and is expected to continue growing rapidly over the next 20 years. Once recognized as “Canada’s Automotive Capital”, growth in more knowledge-based and service-oriented industries, driven by the growth of post-secondary and institutional assets, has diversified the economy away from its traditional strengths and into new areas of opportunity.

The Community Adjustment and Sustainability Strategy released in 2008, was prepared to respond to the decline of traditional industries and emergence of new opportunities. The strategy outlined five key sectors of focus for the City:

- Transportation/advanced manufacturing
- Bioscience and agriculture
- Health and wellness
- Information technology
- Sustainable energy

Since 2008, the rapid growth of both the education and health care sector in the City, paired with the transition and restructuring of traditional industries and the emergence of new and innovative opportunities have provided the City with an opportunity to analyze and target new opportunities appropriate to investment attraction, business development, and job growth objectives.

The Sector Analysis and Cluster Development Strategy for the City of Oshawa responds to these new trends, and offers insight into the nature of this growth and transition, as well as the sector-based opportunities that emerge from it. The strategy is meant to identify those opportunities that present the highest potential for Oshawa, and offer insight into the strategic directions and actions needed to support the development of coordinated and integrated clusters of activity around these opportunities.



## 2.1 Approach

The primary objective for any sector analysis and cluster development strategy is to identify the highest priority opportunities for economic development in a community, and the appropriate range of support structures, programs facilities, and resources that facilitate the emergence of those opportunities. This in turn fosters the creation of high quality jobs, attracts and retains investment, and offers opportunities for existing businesses and entrepreneurs to grow their businesses.

To do this, consideration must be given to the underlying condition of a local economy. This is achieved through a solid understanding of a region's performance against a range of economic indicators combined with an analysis of current and emerging business and industrial investment trends and input from the community at large. The approach employed in the completion of the sector analysis and cluster development strategy has involved the following steps:

- A background review and industry analysis, including an assessment of current labour force, employment, and business trends in Oshawa, Durham Region, and Ontario to identify existing and emerging areas of economic opportunity
- Comprehensive profiles of five key target sectors for Oshawa, including an assessment of their recent performance, an audit of their current structure and prospects, and identification of their existing value chain and support structures
- Input from key business and community stakeholders in the form of one-on-one interviews, intended to offer insight into the strengths, weaknesses, opportunities, and threats related to the positioning of the City to attract new business investment and effectively compete for and sustain economic growth

The resulting cluster development strategy reflects on the findings of the process, and provides an action plan that identifies the strategies and tactics required to support the growth and transition of the City's economy based on new areas of opportunity.





## 3 Industry Analysis

The following profile of Oshawa's industry and business community has been assembled using a range of current economic and demographic data resources, including the Census of Canadian Population (2006 and 2011), the National Household Survey (2011), and Canadian Business Patterns Data (2008 and 2012). The intent of the analysis is to identify key industry and labour force characteristics of the City of Oshawa, in order to determine target sector decisions in subsequent sections of the study.

### 3.1 Labour Force Characteristics

Resident labour force by industry can provide an indication of the areas in which a community or jurisdiction can provide support to investment attraction and retention initiatives based on the skills of its labour force. Figure 1 outlines labour force figures for the City of Oshawa, Region of Durham, and Ontario by major sector.



FIGURE 1: LABOUR FORCE BY INDUSTRY (NAICS), OSHAWA, DURHAM REGION, ONTARIO, 2006 AND 2011

Industry (NAICS)	2006			2011			% Change (2006-2011)		
	Oshawa	Durham	Ontario	Oshawa	Durham	Ontario	Oshawa	Durham	Ontario
Total	74,995	308,890	6,473,735	75,410	327,815	6,680,250	0.5%	6.1%	3.2%
11 Agriculture, forestry, fishing and hunting	285	2,955	114,345	335	2,975	101,280	17.5%	0.7%	-11.4%
21 Mining, quarrying, and oil and gas extraction	25	440	25,445	65	490	29,985	160.0%	11.4%	17.8%
22 Utilities	1,450	7,485	50,215	1,780	9,055	57,035	22.8%	21.0%	13.6%
23 Construction	5,100	20,755	384,780	5,430	21,835	417,900	6.5%	5.2%	8.6%
31-33 Manufacturing	12,765	40,530	899,670	7,885	30,175	697,565	-38.2%	-25.5%	-22.5%
41 Wholesale trade	3,175	16,045	307,465	3,405	16,585	305,030	7.2%	3.4%	-0.8%
44-45 Retail trade	9,200	36,610	720,230	9,695	38,620	751,200	5.4%	5.5%	4.3%
48-49 Transportation and warehousing	3,550	13,875	307,480	3,900	14,655	307,405	9.9%	5.6%	0.0%
51 Information and cultural industries	1,730	9,355	172,795	1,910	10,705	178,720	10.4%	14.4%	3.4%



Industry (NAICS)	2006			2011			% Change (2006-2011)		
	Oshawa	Durham	Ontario	Oshawa	Durham	Ontario	Oshawa	Durham	Ontario
52 Finance and insurance	2,455	18,345	316,170	2,965	21,910	364,415	20.8%	19.4%	15.3%
53 Real estate and rental and leasing	1,395	6,330	126,440	1,355	6,345	133,980	-2.9%	0.2%	6.0%
54 Professional, scientific and technical services	3,395	19,855	471,620	3,525	21,760	511,020	3.8%	9.6%	8.4%
55 Management of companies and enterprises	60	375	8,440	70	275	6,525	16.7%	-26.7%	-22.7%
56 Administrative and support, waste management and remediation services	4,890	15,485	314,005	4,340	15,420	309,630	-11.2%	-0.4%	-1.4%
61 Educational services	4,960	20,335	433,485	5,595	23,950	499,690	12.8%	17.8%	15.3%
62 Health care and social assistance	7,175	27,980	611,740	8,830	33,925	692,130	23.1%	21.2%	13.1%
71 Arts, entertainment and recreation	1,245	6,085	140,830	1,500	7,050	144,065	20.5%	15.9%	2.3%



Industry (NAICS)	2006			2011			% Change (2006-2011)		
	Oshawa	Durham	Ontario	Oshawa	Durham	Ontario	Oshawa	Durham	Ontario
72 Accommodation and food services	4,420	16,390	414,970	4,750	17,730	417,675	7.5%	8.2%	0.7%
81 Other services (except public administration)	3,635	13,460	303,515	3,260	13,085	296,340	-10.3%	-2.8%	-2.4%
91 Public administration	4,080	16,185	350,075	4,805	21,270	458,665	17.8%	31.4%	31.0%

Source: Statistics Canada, 2006 Census of Population, 2011 National Household Survey

Like Durham Region and Ontario, the City's labour force is primarily accommodated within retail trade (12.9%), health care and social assistance (11.7%), and manufacturing (10.5%). The most prominent change in labour force composition (by share of total) is in the manufacturing sector, which fell from 17.0% of total labour force in 2006 to just 10.5% in 2011 for the City of Oshawa. Despite its continued presence in the City, the sector's prominence compared to others, especially health care and social assistance (particularly in hospitals, ambulatory health care, community health care delivery facilities), has diminished since the last census.

Growth of the resident labour force in Oshawa was relatively flat from 2006 to 2011 (0.5%), despite population growth of 5.7% over the same time period in the City. Interestingly, the City did not leverage the labour force growth that occurred across all of Durham Region (6.1%) over that time period. Despite the overall decline, a number of knowledge-based sectors experienced notable growth from 2006 to 2011, including:

- Health care and social assistance (23.1%)
- Finance and insurance (20.8%)



- Public administration (17.8%)

In the case of health care and social assistance, the labour force has grown faster than at the Regional and Provincial level. Labour force in more industrial and goods producing sectors grew as well in the City from 2006 to 2011, often at rates faster than the regional and provincial rates (e.g. utilities, wholesale trade, transportation and warehousing). The manufacturing sector experienced the largest decline in resident labour force since 2006, tied to wide-spread restructuring of the manufacturing sector across the province over the time period.

Based on location quotients<sup>1</sup>, the utilities sector is the only major sector that shows a local concentration of labour (which has grown since 2006), particularly in electric power generation, transmission, and distribution (owed likely to the presence of OPG's nuclear power stations in Pickering and Darlington). A number of other sectors experienced an increase in their local concentration of the labour force since 2006:

- Administrative and support, waste management and remediation services
- Construction
- Health care and social assistance
- Transportation and warehousing
- Information and cultural industries
- Arts, entertainment, and recreation

Much of the increase in relative concentration of labour appears to be at the expense of the manufacturing sector, whose relative concentration fell from 2006 to 2011. Overall, this may suggest an increasing diversification of the economy, away from the relative concentration of labour and business activity once held by the manufacturing sector.

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<sup>1</sup> Local concentration by location quotient (LQ). An LQ measures the concentration of business activity in a local area (e.g. City of Oshawa) relative to an over-arching area (e.g. Ontario). An LQ of over 1.25 suggests a local relative concentration of activity. In theory, this suggests the local sector is exceeding local demand, and exporting products/services to areas outside of the local community. A sector LQ of less than 0.75 suggests a gap area, where the local business community is theoretically falling short of local demand. From a labour force perspective, LQs may offer insight into where local concentrations of industry-relevant skills may exist.



FIGURE 2: LABOUR FORCE LQ BY INDUSTRY, CITY OF OSHAWA (VS. ONTARIO), 2006 AND 2011

Industry (NAICS)	2006		2011	
	LQ	Classification	LQ	Classification
22 Utilities	2.49	High	2.77	High
56 Administrative and support, waste management and remediation services	1.34	High	1.24	Average
23 Construction	1.14	Average	1.15	Average
44-45 Retail trade	1.10	Average	1.14	Average
62 Health care and social assistance	1.01	Average	1.13	Average
48-49 Transportation and warehousing	1.00	Average	1.12	Average
72 Accommodation and food services	0.92	Average	1.01	Average
31-33 Manufacturing	1.22	Average	1.00	Average
61 Educational services	0.99	Average	0.99	Average
41 Wholesale trade	0.89	Average	0.99	Average
81 Other services (except public administration)	1.03	Average	0.97	Average
55 Management of companies and enterprises	0.61	Low	0.95	Average
51 Information and cultural industries	0.86	Average	0.95	Average
91 Public administration	1.01	Average	0.93	Average
71 Arts, entertainment and recreation	0.76	Average	0.92	Average
53 Real estate and rental and leasing	0.95	Average	0.90	Average
52 Finance and insurance	0.67	Low	0.72	Low
54 Professional, scientific and technical services	0.62	Low	0.61	Low
11 Agriculture, forestry, fishing and hunting	0.22	Low	0.29	Low
21 Mining, quarrying, and oil and gas extraction	0.08	Low	0.19	Low

Source: Statistics Canada, 2006 Census of Population, 2011 National Household Survey

Looking at the resident population by occupational classification provides insight on the actual skills held by local residents, regardless of the industry in which they are employed. Between 2006 and 2011, the major occupational classifications holding the largest share of total labour force remained



sales and service occupations; trades, transport, and equipment operators and related occupations; and business, finance, and administrative occupations. Occupations within these classifications range from semi-skilled and unskilled requiring little formal training, up to key knowledge-based or skilled trade occupations requiring post-secondary skills. Only sales and service occupations experienced an increase in the share of total labour force within that group, though management occupations; natural and applied sciences and related occupations; health occupations; and occupations in education, law, and social, community, and government services increased their share. As with the decline of labour in the manufacturing industry, occupations in manufacturing and utilities went from a share of 10.4% of labour force in 2006 to 5.9% in 2011.

Outside of the growth of labour force with natural resources, agriculture and related occupations (which accommodate only a small share of total labour force), the occupational classifications that have accommodated the most growth in resident labour force since 2006 include:

- Health occupations (27.0%)
- Occupations in education, law, and social, community and government services (12.3%)
- Natural and applied sciences and related occupations (10.7%)
- Management occupations (10.2%)

This largely matches growth trends at the regional and provincial level, though the City's growth of labour force in each occupational classification outside of management occupations exceeded growth at the regional and provincial level. Matching labour force trends by industry, labour force with occupations in trades, transport and equipment operation and manufacturing and utilities declined over the time period, at rates faster than the Regional and provincial levels. Despite the decline, the City retains a strong share of labour force in trades, transport, and equipment operators and related occupations, which accounts for many of the more paraprofessional and skilled occupations required by manufacturing, utilities, construction, and transportation and logistics industries.



FIGURE 3: LABOUR FORCE BY OCCUPATION (NOC), OSHAWA, DURHAM REGION, ONTARIO, 2006 AND 2011

Occupations (NOC)	2006			2011			% Change (2006-2011)		
	Oshawa	Durham	Ontario	Oshawa	Durham	Ontario	Oshawa	Durham	Ontario
Total	74,958	308,770	6,471,291	75,405	327,815	6,680,260	0.6%	6.2%	3.2%
0 Management occupations	6,462	35,616	724,853	7,120	40,895	770,580	10.2%	14.8%	6.3%
1 Business, finance and administration occupations	12,231	56,894	1,106,458	11,820	58,985	1,138,330	-3.4%	3.7%	2.9%
2 Natural and applied sciences and related occupations	3,412	19,600	451,478	3,775	21,655	494,500	10.7%	10.5%	9.5%
3 Health occupations	3,566	15,168	341,783	4,530	18,425	392,695	27.0%	21.5%	14.9%
4 Occupations in education, law and social, community and government services	7,647	31,952	709,803	8,585	39,055	801,465	12.3%	22.2%	12.9%
5 Occupations in art, culture, recreation and sport	1,736	7,342	179,334	1,690	9,090	206,420	-2.6%	23.8%	15.1%
6 Sales and service occupations	18,241	70,892	1,484,372	19,685	74,705	1,550,260	7.9%	5.4%	4.4%
7 Trades, transport and equipment operators and related occupations	13,196	46,697	889,380	12,780	45,265	868,515	-3.1%	-3.1%	-2.3%
8 Natural resources, agriculture and related production occupations	702	3,859	109,286	960	4,770	106,810	36.8%	23.6%	-2.3%
9 Occupations in manufacturing and utilities	7,767	20,749	474,545	4,460	14,970	350,685	-42.6%	-27.9%	-26.1%

Source: Statistics Canada, 2006 Census of Population, 2011 National Household Survey

Overall, labour force trends and characteristics point to some interesting shifts in the prominence of industrial and manufacturing-related skills and employment in the City. Where manufacturing occupations and employment once accounted for major shares of labour force activity in Oshawa –





tied to major users like General Motors and their network of suppliers throughout the region – occupations and employment in other industries like health care, education, utilities, transportation and trade, construction, and business services have taken on more prominence in the local economy.

## 3.2 Business Characteristics

Canadian Business Patterns data<sup>2</sup> can provide an indication of the current business base across Oshawa and Ontario. Businesses in the subtotal categorization include those that maintain an employee payroll, while those in the indeterminate (Ind) categorization include those that do not maintain a payroll, but may have a workforce which consists of contracted workers, family members, or business owners. Figure 4 outlines the business base by major sector in Oshawa and Ontario in 2008 and 2012.

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<sup>2</sup> Provided by Statistics Canada and Canada Revenue Agency, Canadian Business Patterns data provides an indication of the number of local businesses present in a community by location, including sole-proprietor businesses or those without a payroll.



FIGURE 4: BUSINESS PATTERNS (LOCATIONS), CITY OF OSHAWA AND ONTARIO, 2008 AND 2012

Industry (NAICS)	2008						2012					
	Oshawa			Ontario			Oshawa			Ontario		
	Total	Ind	Subtotal	Total	Ind	Subtotal	Total	Ind	Subtotal	Total	Ind	Subtotal
Total	5,921	3,249	2,672	885,714	499,797	385,917	6,076	3,314	2,762	910,821	512,951	397,870
11 - Agriculture, Forestry, Fishing and Hunting	39	27	12	33,529	24,569	8,960	48	33	15	37,800	27,770	10,030
21 - Mining, Quarrying, and Oil and Gas Extraction	6	2	4	1,412	665	747	4	2	2	1,544	741	803
22 - Utilities	6	4	2	826	338	488	11	7	4	1,012	521	491
23 - Construction	906	620	286	99,222	60,423	38,799	930	642	288	101,804	60,702	41,102
31-33 - Manufacturing	195	84	111	35,272	13,209	22,063	171	68	103	31,219	11,109	20,110
41 - Wholesale Trade	222	107	115	44,881	20,722	24,159	188	84	104	38,381	15,367	23,014
44-45 - Retail Trade	752	256	496	84,339	33,022	51,317	771	250	521	82,631	30,713	51,918
48-49 - Transportation and Warehousing	283	208	75	47,767	32,796	14,971	290	211	79	48,443	30,555	17,888
51 - Information and Cultural Industries	54	31	23	14,336	9,114	5,222	61	33	28	15,565	9,568	5,997
52 - Finance	296	191	105	53,505	37,265	16,240	301	187	114	55,262	38,368	16,894



Industry (NAICS)	2008						2012					
	Oshawa			Ontario			Oshawa			Ontario		
	Total	Ind	Subtotal	Total	Ind	Subtotal	Total	Ind	Subtotal	Total	Ind	Subtotal
and Insurance												
53 - Real Estate and Rental and Leasing	538	430	108	79,976	65,400	14,576	666	531	135	105,961	86,083	19,878
54 - Professional, Scientific and Technical Services	721	451	270	134,675	87,746	46,929	727	444	283	136,505	85,669	50,836
55 - Management of Companies and Enterprises	192	153	39	39,623	34,226	5,397	165	131	34	34,783	29,926	4,857
56 - Administrative and Support, Waste Management and Remediation Services	299	161	138	39,670	21,143	18,527	300	164	136	39,815	21,363	18,452
61 - Educational Services	71	31	40	9,888	5,252	4,636	62	28	34	9,031	4,419	4,612
62 - Health Care and Social Assistance	348	67	281	40,567	7,670	32,897	406	93	313	50,298	14,244	36,054
71 - Arts, Entertainment	86	47	39	14,586	9,168	5,418	83	43	40	14,769	9,092	5,677



Industry (NAICS)	2008						2012					
	Oshawa			Ontario			Oshawa			Ontario		
	Total	Ind	Subtotal	Total	Ind	Subtotal	Total	Ind	Subtotal	Total	Ind	Subtotal
and Recreation												
72 - Accommodation and Food Services	282	81	201	36,308	10,819	25,489	293	71	222	35,882	9,545	26,337
81 - Other Services (except Public Administration)	622	298	324	74,086	26,153	47,933	596	291	305	68,758	27,078	41,680
91 - Public Administration	3	0	3	1,246	97	1,149	3	1	2	1,358	118	1,240

Source: Statistics Canada, Canadian Business Patterns, 2008 and 2012

The City's total business base is primarily accommodated within four sectors, which account for just over half of all business activity in the City in 2012:

- Construction (15.3%)
- Retail trade (12.7%)
- Professional, scientific, and technical services (12.0%)
- Real estate and rental and leasing (11.0%)

This is similar to trends at the provincial level, though the City's share of businesses in construction and retail trade exceed the shares of business at the provincial level. For the construction sector, the City holds notable comparative levels of business activity in foundation, structure, and building exterior contractors; building finishing contractors; other heavy and civil engineering construction; and highway, street, and bridge construction based on the total business base.

Trends are also similar when considering employer businesses across the City, with related sectors accounting for the majority of the business base. However, the health care and social assistance



sector – based on ambulatory health care businesses – emerges as a notable component of the City's business base when considering employer businesses.

Overall, the City's business base grew by 2.6% between 2008 and 2012, primarily driven by 3.4% growth of employer establishments. The City has seen growth in a number of sectors by total number of businesses, with the number of businesses in the following sectors growing more rapidly than at the regional and provincial level between 2008 and 2012:

- Utilities (83%); particularly electric power generation, transmission, and distribution and water systems
- Agriculture, forestry, fishing, and hunting (23%); particularly oilseed and grain farming
- Information and cultural industries (13%); particularly in publishing industries

The city has also seen growth in real estate and rental and leasing (23.8%) and health care and social assistance businesses (16.7%); the former driven by lessors of real estate property (both residential and non-residential) and activities related to real estate (e.g. property management, real estate appraisal), and the latter driven by growth in offices of other health care practitioners (e.g. chiropractors, optometrists) and community health and wellness delivery services (e.g. social assistance).

The City's business community experienced decline in several sectors since 2008 as well, most notably in wholesale trade (15.3%) and manufacturing (12.3%). Though the decline of total business locations for each sector exceeded declines at the regional and provincial level, the decline in the number of manufacturing sector employers in Oshawa (7.2%) was lower than declines at the regional (7.5%) and provincial level (8.9%). Growth in a number of more advanced manufacturing subsectors like plastic product manufacturing, steel product manufacturing, architectural and structural metals manufacturing, and general purpose machinery manufacturing limited the overall decline.

By size, the majority of business locations in the City fall into the indeterminate category (54.5%); slightly lower than the 56.3% that fall into indeterminate at the provincial level. However, the characteristics of the business base in Oshawa by employee size are similar to provincial characteristics, where 94.6% of employer businesses have fewer than 50 employees (compared to 94.9% across Ontario). Approximately half (49.6%) of all employer businesses across the City fall into the micro (one to four employee) size range, while an additional 47.9% have between five and 99



employees, suggesting that any business support or development activities need to be reflective of the fact that small businesses account for a majority of employer businesses in the City.

Size characteristics differ by economic sector across the City as well. Micro-sized (one to four employees) businesses are primarily accommodated in professional, scientific, and technical services, other services (except public administration), construction, and retail trade. Large (500+ employee) businesses in the City are primarily accommodated within educational services (owed to the presence of UOIT, Durham College, and Durham District/Durham Catholic District school boards), with single business locations in manufacturing, wholesale trade, health care, and public administration as well.



FIGURE 5: BUSINESS PATTERNS BY SIZE, CITY OF OSHAWA, 2012

Industry (NAICS)	Total	Ind	Employers								
			Subtotal	1 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500+
Total	6,076	3,314	2,762	1,371	590	398	255	79	43	17	9
11 - Agriculture, forestry, fishing and hunting	48	33	15	7	2	4	0	2	0	0	0
21 - Mining, quarrying, and oil and gas extraction	4	2	2	1	0	0	1	0	0	0	0
22 - Utilities	11	7	4	2	0	1	0	0	0	1	0
23 - Construction	930	642	288	169	71	29	13	5	1	0	0
31-33 - Manufacturing	171	68	103	43	22	7	19	7	3	1	1
41 - Wholesale trade	188	84	104	32	34	19	12	4	1	1	1
44-45 - Retail trade	771	250	521	168	157	110	55	11	16	4	0
48-49 - Transportation and warehousing	290	211	79	46	12	7	5	3	4	1	1
51 - Information and cultural industries	61	33	28	10	7	2	6	1	2	0	0
52 - Finance and insurance	301	187	114	51	18	16	27	2	0	0	0
53 - Real estate and rental and leasing	666	531	135	95	15	16	7	2	0	0	0
54 - Professional, scientific and technical services	727	444	283	230	32	14	5	0	0	2	0
55 - Management of companies and enterprises	165	131	34	18	5	2	5	3	1	0	0
56 - Administrative and support, waste	300	164	136	71	29	17	8	2	4	5	0



Industry (NAICS)	Total	Ind	Employers									
			Subtotal	1 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500+	
management and remediation services												
61 - Educational services	62	28	34	15	5	4	5	1	0	0	4	
62 - Health care and social assistance	406	93	313	143	62	67	24	9	6	1	1	
71 - Arts, entertainment and recreation	83	43	40	11	8	7	11	1	1	1	0	
72 - Accommodation and food services	293	71	222	60	47	51	41	19	4	0	0	
81 - Other services (except public administration)	596	291	305	199	64	25	11	6	0	0	0	
91 - Public administration	3	1	2	0	0	0	0	1	0	0	1	

Source: Statistics Canada, Canadian Business Patterns, 2012

Overall, the business characteristics of the City reflect the labour force characteristics, where sectors like utilities, construction, and health care and social assistance continue to drive business development in the community, despite the overall declines in manufacturing and other industrial sectors which have traditionally been perceived as central to Oshawa's success. These represent the current strengths of the City upon which to build out niche sector opportunities (e.g. energy generation, health and biosciences).

However, despite the turbulence that manufacturing and other industrial sectors have experienced over the last several years, Oshawa's business base illustrates that the traditional strengths in major sectors like manufacturing persist in the City. The challenge from a target sector perspective is to build on nascent and emerging businesses and subsectors that have contrasted overall declines and leveraged the City's traditional labour force strengths and infrastructure to find new areas of growth, while also supporting traditional sectors that still present viable economic development opportunity.





## 3.3 Targeting Economic Sectors

The overall intent of the industry analysis was to identify data-supported conclusions about the City's current economy, with a view to identifying target sector and cluster development opportunities for Oshawa to build on. This section reflects on current strategic initiatives, and offers insight into new areas of focus for the City.

### 3.3.1 Current Target Sector Focus

Much of the industry analysis work has been framed by the industry sector analysis and target sector choices in the Community Adjustment and Sustainability Strategy, completed by the City in 2008. That strategy outlined five economic sectors of focus for the City:

- Transportation/advanced manufacturing
- Bioscience and agriculture
- Health and wellness
- Information technology
- Sustainable energy

Based on the industry analysis and the sector definitions (by NAICS) provided in 2008, a number of observations can be made about the City's current competitive positioning in these sectors:

- **Transportation/advanced manufacturing:** The sector remains a major employer in the City in 2011, despite declines in the number of workers employed in the sector since 2006. The City's occupational profile continues to show high levels of labour force capabilities in skilled trades and technical occupations integral to the sector – particularly at the apprenticeship/post-secondary level. Despite a declining and comparatively low relative concentration of labour and business, there are notable growth trends and characteristics in advanced manufacturing sectors like pharmaceuticals and medicine, architectural and structural metals, engines/turbines/power generation equipment, motor vehicles, railroad rolling stock, machine shops, and general purpose machinery (e.g. pumps, compressors, material handling equipment).
- **Bioscience and agriculture:** A small share of resident labour force is engaged in the bioscience and agriculture sector, despite a comparatively stronger rate of growth in the resident agricultural



sector labour force across the City than at the regional level since 2006. From a business perspective, there was a low concentration of total businesses in the sector despite local growth that exceeded provincial level growth. The strongest business subsectors in bioscience and agriculture were related to more health and wellness industries. Pharmaceuticals and medicine manufacturing illustrated growth trends to 2012, supported by growth of oilseed and other crop (e.g. fruit and vegetable) agricultural operations relevant to biosciences applications (e.g. industrial biotechnology or nutraceuticals).

- **Health and wellness:** The health and wellness sector remains a major employer across the local, regional, and provincial economy, with local sector employment rising at a faster rate than across Durham and Ontario. Primary care delivery – through hospitals, ambulatory health care, and nursing and residential care – represents the largest subsector by resident employment. From a business perspective, medical and equipment supplies manufacturers, dentists and other health care practitioners, and hospitals account for the majority of activity, with local business growth trends showing opportunity in areas like primary care delivery (e.g. hospitals, other medical practitioners, home health care) and manufacturing (e.g. medical equipment and supplies).
- **Information technology:** Sectors that drive information technology (e.g. information and cultural industries, and professional, scientific, and technical services) account for smaller shares of resident labour force in Oshawa than at the regional and provincial level. While information and cultural industries labour force has grown in the City at a faster rate than across Durham and Ontario since 2006, the growth rate of labour force in the professional, scientific, and technical services sector has been slower. The sector has experienced business growth exclusively in professional, scientific, and technical services subsectors (computer systems design and related services) since 2008, despite an overall decline in the number of businesses in the City.
- **Sustainable energy:** Despite the small shares of resident labour force accounted for in utilities and construction sectors, both Oshawa and Durham show notable strengths compared to the province. In 2011, utilities is the only sector with a high concentration of labour force in Oshawa relative to the province, and the City's occupational profile suggests that trades-based occupations continue to account for a notable share of the local labour force. The relative concentration of sustainable energy businesses in the sector is slightly higher than the provincial average in 2012, with the total number of businesses in the sector growing from 2008 to 2012. The city's business strengths in the sector are related to electric power generation, non-residential



building construction, and other heavy and civil engineering construction (e.g. hydroelectric generating station construction).

### 3.3.2 Notable Industry Analysis Findings

In addition to findings by industry sector, the industry analysis offers other insight and trends relevant to the choice of target sectors in Oshawa:

- **Transportation and warehousing has emerged as a notable sector:** With 9.9% growth in labour force since 2006 (above that of the Region and Province), and an average (but rising) relative concentration of local labour force despite its comparatively small size, transportation and warehousing industries should be noted in the overall context of the Oshawa economy. Business patterns since 2008 suggest emerging strengths in small businesses in the sector, supported by an emerging base and regional/provincial growth in the sector. The City has high local relative business concentrations in logistics/support industries for water, air, and rail, while business growth trends point to opportunities around specialized freight trucking, support for air and rail goods movement, freight arrangement, and couriers.
- **Advanced manufacturing has diversified away from automotive:** Despite external challenges, the City retains business growth and retention opportunities in a wide range of advanced and manufacturing industries like plastic products, rubber product manufacturing, cement and concrete products, steel products from purchased steel, architectural and structural metals, machine shops, general purpose machinery, audio/video equipment, motor vehicles, motor vehicle body, and railroad rolling stock
- **Public health care and social assistance sector has anchored industry growth:** The City has current and emerging business strengths in a number of areas of health care and social assistance that could anchor further business activity or research connections in areas like community health and wellness delivery (e.g. residential care, vocational rehabilitation, and home health care) or pharmaceuticals
- **Niche IT subsectors have emerged to support other businesses:** Software publishing, other telecommunications (e.g. ISPs, communications resellers), and other information services businesses (e.g. internet publishing) – though relatively small sectors – exhibit characteristics as



emerging strengths from an IT perspective, which may assist in the development of other key sectors.

- **Professional, scientific, and technical consulting growth offers support to other sectors:** Professional, scientific, and technical services continues to account for low proportions of total labour force in the City, as well as low relative concentrations of resident labour force compared to the province. Business characteristics suggest emerging strengths in the professional services related to architecture/engineering, specialized design, and management, scientific, and technical consulting services – all of which what the potential to support knowledge-based activities in other sectors (e.g. advanced manufacturing, energy, health, and transportation and logistics).

### 3.3.3 Renewed Target Sector Focus

Building on the preliminary industry analysis, industry targeting methodology to identify subsectors of note, and background review activities, the following five sectors were identified for further study in the Sector Analysis and Cluster Development Strategy process:

- **Advanced manufacturing:** Despite external challenges and a declining base with some more traditional industry subsectors (e.g. motor vehicles) manufacturing remains a major employer in the City. The City's industry subsectors of strength (e.g. materials, transportation equipment) are characterized as some of the most R&D intensive subsectors of manufacturing, while sectors that offer high levels of value-added opportunity in innovation and globalization (e.g. electronics, medical devices, motor vehicles, machinery) are present as well. As a result, support is needed to continue the transition of manufacturing to new and high-value areas outside of traditional strengths.
- **Health and biosciences:** The City's success in biotechnology-related areas defined through the 2008 strategy was related to pharmaceuticals and medicines (rather than strictly industrial), related specifically to programming at UOIT and Durham College (e.g. applied bioscience, pharmaceutical and biological chemistry, science and food technology) suggesting agriculture and biosciences can be folded into health industries from a nutraceuticals/functional foods perspective. Further, the City has a strong profile of manufacturers in medical equipment and supplies, which enhances the City's competitive positioning in the sector from a business perspective. The sector is underpinned by rapid labour force growth and positive business



patterns trends in ambulatory care, hospitals, and nursing/residential care, suggesting that a target sector focus spanning population-related and traded sectors of the economy can be used.

- **Energy generation:** There has been strong local and regional labour force growth in the utilities sector since 2008, and continued competitive rates of business growth in electrical power generation, which suggests a continued emphasis on energy generation in the City – both traditional (e.g. nuclear) and renewable. The growth trends in non-residential and civil construction and electrical equipment manufacturing underpin opportunities for major projects, while trades-based strengths suggest smaller-scale opportunities in the sector (e.g. installation).
- **Multimodal transportation and logistics:** Though not a sector of focus in 2008, recent growth trends at the provincial, regional, and local level suggest there may be opportunities for the City tied to its existing and emerging major infrastructure facilities (e.g. Oshawa Municipal Airport, Port of Oshawa, Highway 401/Highway 407 East). Business patterns since 2008 place emphasis especially on specialized truck transportation, as well as support/logistical services for freight arrangement, and air, rail, and marine goods movement. Labour force and business trends suggest a true multimodal focus for transportation industries in the City.
- **Information Technology:** The City's previous information technology focus was based on the presence of professional services and IT sector activity, but the City's competitive positioning in pure IT-related activities was limited in scale. However, labour force and business growth trends in professional services – particularly management, scientific, and technical consulting services – and information and cultural industries – in data processing and software publishing – may offer support to the growth of the City's presently nascent business process improvement sector and niche areas of IT in other target sectors.



## 4 Target Sector Profiles

Building on the findings of the industry analysis and stakeholder consultations, this section of the report provides profiles of each of the five target sectors for the City of Oshawa. An audit of the City of Oshawa's ecosystem in each of these sectors was compiled, encompassing labour force and business trends, companies, educational institutions and programs, research and development activities, and business and professional support. The work also addressed current sector trends and best practice in locations known to have strengths in those target sectors.

The work drew on a number of regional, local and sector studies pertaining to the target sectors with the intention of building on this work while acknowledging important sector trends and best practice. In doing so, recommendations have been made to leverage sector strengths and address barriers to growth, with the overall objective of providing a foundation for long-term sustainable sector strategies that will underpin the growth of Oshawa's economy.

The Value chain charts provide a snapshot of each sector's ecosystem in Oshawa. Companies were sourced from Hoovers, Oshawa business directory, Oshawa's business count survey data, and through the consultations in regards to emerging companies. The companies, organizations and institutions are categorized according to their position in the value chain:

- Companies – broken down into the value chain where possible
- Companies providing business support services
- Specialist industry support
- Education, training and human resources support
- Regional commercialization and business support networks
- Research and development activities and facilities
- Education programs
- Existing and emerging skill sets in the workforce with number of graduates enrolled and conferred at local and regional education institutions

The charts do not represent an exhaustive list of companies in each sector. Rather, it is intended to illustrate the strengths of the sector with a selection of key companies. Definitions of each target sector by NAICS code are included in Appendix I. A detailed breakdown and profile of each sector is



included in Appendix II, while a breakdown of educational programming, graduates, and enrollments is available in Appendix III.

## 4.1 Advanced Manufacturing

### 4.1.1 Labour Force and Business Trends

Global and external economic trends and conditions continue to affect the structure of North America's manufacturing sector. In order to remain competitive, manufacturers are continuing to invest in innovation and productivity enhancements to move up the value chain into more valuable and research- and trade-intensive products characteristic of the advanced manufacturing sector. The advanced manufacturing sector employs a skilled work force and includes firms that produce machinery and equipment, electronic products and transportation equipment, among other subsectors. Figure 6 outlines the profile of advanced manufacturing subsectors by labour force and businesses in Oshawa.

Advanced manufacturing industries in Oshawa employ approximately 6,785 people, giving the industry a slightly higher than average relative concentration (LQ 1.06) compared to the province. Location quotients suggest that Oshawa's resident labour force represents strengths in the following advanced manufacturing subsectors:

- Motor vehicle manufacturing (LQ 4.03)
- Rubber product manufacturing (LQ 2.59)
- Commercial and industrial machinery and equipment rental and leasing (LQ 2.16)
- Printing and related support activities (LQ 1.73)
- Other chemical product manufacturing<sup>3</sup> (LQ 1.73)
- Other electrical equipment manufacturing<sup>4</sup> (LQ 1.46)
- Electrical equipment manufacturing (LQ 1.46)

Business patterns data reveals that there were 385 establishments in the advanced manufacturing industry in Oshawa in 2012, down 9% from 2008. By number of firms, support sectors like

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<sup>3</sup> Examples include custom compounding of purchased resins, printing ink manufacturing.

<sup>4</sup> Examples include battery manufacturing, communication and energy wire cable manufacturing, and wiring device manufacturing.





professional, scientific and technical services (e.g. consulting, specialized design) and repair and maintenance account for the highest shares of advanced manufacturing businesses in 2012. However the majority of the businesses in these subsectors saw decreases in the number of firms from 2008 to 2012, with the exception being the electronic and precision equipment repair subsector. In the more core advanced manufacturing subsector, firms that produce fabricated metals, machinery, and medical equipment and supplies – industries with high R&D and capital intensities, and high shares of global value-added characteristics – make up a large portion of the business base.

The highest rates of business growth in Oshawa's advanced manufacturing sector from 2008 to 2012 were illustrated by the smallest subsectors: ventilation, heating, air-conditioning and commercial refrigeration equipment manufacturing (300%), plastic product manufacturing (133%), other fabricated metal product manufacturing (100%), pharmaceutical and medicine manufacturing (100%), and steel product manufacturing from purchased steel (100%). However, subsectors with a high number of firms such fabricated metals, machinery, machine shops, and medical equipment and supplies have remained relatively stable during the same time period, contrasting the overall declines in labour and business activity.





FIGURE 6: ADVANCED MANUFACTURING INDUSTRY PROFILE, CITY OF OSHAWA AND ONTARIO

Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
Total	1.06	Average	6,765	572,585	385	425	-9.4%
3231 - Printing and Related Support Activities	1.73	High	575	29,880	16	21	-23.8%
3251 - Basic Chemical Manufacturing	0.49	Low	35	6,395	0	0	N/A
3252 - Resin, Synthetic Rubber, and Artificial and Synthetic Fibres and Filaments Manufacturing	0.55	Low	20	3,285	0	0	N/A
3253 - Pesticide, Fertilizer and Other Agricultural Chemical Manufacturing	0.00	Low	-	695	0	0	N/A
3254 - Pharmaceutical and Medicine Manufacturing	1.20	Average	180	13,550	2	1	100.0%
3255 - Paint, Coating and Adhesive Manufacturing	0.96	Average	40	3,750	1	0	N/A
3256 - Soap, Cleaning Compound and Toilet Preparation Manufacturing	0.53	Low	40	6,765	1	1	0.0%
3259 - Other Chemical Product Manufacturing	1.73	High	85	4,425	0	1	-100.0%
3261 - Plastic Product Manufacturing	0.64	Low	260	36,325	7	3	133.3%
3262 - Rubber Product Manufacturing	2.59	High	165	5,735	3	3	0.0%
3311 - Iron and Steel Mills and Ferro-Alloy Manufacturing	1.28	High	225	15,835	0	0	N/A
3312 - Steel Product Manufacturing from Purchased Steel	0.98	Average	45	4,130	2	1	100.0%
3313 - Alumina and Aluminum Production and Processing	0.00	Low	-	2,245	0	0	N/A
3314 - Non-Ferrous Metal (except	0.00	Low	-	1,885	0	0	N/A



Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
Aluminum) Production and Processing							
3321 - Forging and Stamping	0.92	Average	40	3,925	1	2	-50.0%
3322 - Cutlery and Hand Tool Manufacturing	0.00	Low	-	2,005	1	0	N/A
3323 - Architectural and Structural Metals Manufacturing	0.91	Average	170	16,910	10	9	11.1%
3324 - Boiler, Tank and Shipping Container Manufacturing	1.02	Average	55	4,850	0	0	N/A
3325 - Hardware Manufacturing	0.00	Low	-	2,575	0	0	N/A
3326 - Spring and Wire Product Manufacturing	0.00	Low	-	1,915	0	0	N/A
3327 - Machine Shops, Turned Product, and Screw, Nut and Bolt Manufacturing	0.66	Low	115	15,735	12	12	0.0%
3328 - Coating, Engraving, Heat Treating and Allied Activities	0.97	Average	60	5,585	1	4	-75.0%
3329 - Other Fabricated Metal Product Manufacturing	0.30	Low	30	8,965	4	2	100.0%
3331 - Agricultural, Construction and Mining Machinery Manufacturing	0.00	Low	-	5,940	2	2	0.0%
3332 - Industrial Machinery Manufacturing	0.41	Low	25	5,490	0	3	-100.0%
3333 - Commercial and Service Industry Machinery Manufacturing	0.00	Low	-	5,765	1	3	-66.7%
3334 - Ventilation, Heating, Air-Conditioning and Commercial Refrigeration Equipment Manufacturing	0.67	Low	40	5,405	4	1	300.0%
3335 - Metalworking Machinery Manufacturing	0.85	Average	130	13,740	2	7	-71.4%
3336 - Engine, Turbine and Power Transmission Equipment Manufacturing	0.00	Low	-	2,240	3	3	0.0%



Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
3339 - Other General-Purpose Machinery Manufacturing	0.49	Low	65	11,865	8	7	14.3%
3341 - Computer and Peripheral Equipment Manufacturing	0.98	Average	60	5,500	1	1	0.0%
3342 - Communications Equipment Manufacturing	0.40	Low	85	18,980	0	0	N/A
3343 - Audio and Video Equipment Manufacturing	0.00	Low	-	800	2	2	0.0%
3344 - Semiconductor and Other Electronic Component Manufacturing	1.05	Average	95	8,170	2	0	N/A
3345 - Navigational, Measuring, Medical and Control Instruments Manufacturing	0.29	Low	35	11,025	2	2	0.0%
3346 - Manufacturing and Reproducing Magnetic and Optical Media	0.00	Low	-	1,340	0	1	-100.0%
3351 - Electric Lighting Equipment Manufacturing	0.00	Low	-	2,325	1	0	N/A
3352 - Household Appliance Manufacturing	0.00	Low	-	1,860	0	0	N/A
3353 - Electrical Equipment Manufacturing	1.46	High	120	7,395	1	1	0.0%
3359 - Other Electrical Equipment and Component Manufacturing	1.53	High	75	4,410	2	3	-33.3%
3361 - Motor Vehicle Manufacturing	4.03	High	1,905	42,555	2	2	0.0%
3362 - Motor Vehicle Body and Trailer Manufacturing	0.00	Low	-	3,495	3	3	0.0%
3363 - Motor Vehicle Parts Manufacturing	1.19	Average	760	57,430	4	5	-20.0%
3364 - Aerospace Product and Parts Manufacturing	0.93	Average	130	12,540	0	1	-100.0%
3365 - Railroad Rolling Stock Manufacturing	0.00	Low	-	2,915	1	1	0.0%
3366 - Ship and Boat Building	0.00	Low	-	1,195	0	0	N/A



Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
3369 - Other Transportation Equipment Manufacturing	0.00	Low	-	1,640	1	1	0.0%
3391 - Medical Equipment and Supplies Manufacturing	0.43	Low	35	7,370	16	16	0.0%
5324 - Commercial and Industrial Machinery and Equipment Rental and Leasing	2.16	High	155	6,470	9	13	-30.8%
5414 - Specialized Design Services	0.73	Low	195	24,170	33	44	-25.0%
5416 - Management, Scientific, and Technical Consulting Services	0.50	Low	350	63,005	176	184	-4.3%
5417 - Scientific Research and Development Services	0.40	Low	95	21,530	4	4	0.0%
8112 - Electronic and Precision Equipment Repair	1.47	High	100	6,145	19	16	18.8%
8113 - Commercial and Industrial Machinery and Equipment (except Automotive) Repair and Maintenance	1.22	Average	170	12,510	25	39	-35.9%

Source: Adapted from Statistics Canada, Census of Canadian Population, 2006 and Canadian Business Patterns Data, 2007 and 2011 by Millier Dickinson Blais, 2012

The auto industry remains an important subsector in the manufacturing industry. The motor vehicle manufacturing subsector had the highest LQ, and employed the largest portion of the workforce (at 28%) in the City's advanced manufacturing industry in 2011. There has been some stability in the number of businesses in the subsector as well. The two firms (General Motors and Raglan Industries) listed in this subsector in 2012 are the same two firms listed in 2008.

Motor vehicle parts manufacturing is also a major source of employment as it was the only other subsector to employ a double digit proportion of the labour force at 11%. However this subsector saw the number of firms decline from five to four between 2008 and 2012. The business patterns and labour force data suggests that the auto industry and advanced manufacturing sector rely on a small number of firms to employ the majority of the workforce in this industry. Despite some diversification,



transportation equipment manufacturing continues to play a major role in the prospects of the industry.

However, a number of other advanced manufacturing subsectors have emerged to offer additional opportunities outside of automotive. Capabilities in medical devices, machinery manufacturing, electrical equipment, and fabricated metals suggest opportunities for the advanced manufacturing sector to support growth in other areas of the City's economy, such as energy generation (e.g. energy structures, batteries/energy storage, metal components), health and biosciences (e.g. medical devices/prototypes, chemicals/pharmaceuticals), and multimodal transportation (e.g. specialized trailers, freight arrangement machinery).

As a result, the cluster development implications of the sector's performance by business and labour force suggest a multi-pronged approach targeted on traditional industrial strengths and emerging advanced manufacturing industries based on regional assets.

#### **4.1.2 Advanced Manufacturing Profile and Value Chain**

Oshawa's advanced manufacturing sector was assessed within the context of a changing environment for Canadian and global manufacturing. As a result, there is an emphasis on moving beyond the City's automotive identity, and supporting the growth of technology-based and advanced manufacturing in new areas. From this perspective, there are several trends that need to be considered for Oshawa's advanced manufacturing sector:

- The global manufacturing sector operations continue to be shaped by information technology integration (e.g. process improvement, modelling and simulation, digital manufacturing), innovation in supply chain management, global demand for capital projects and natural resources, rapid responses to customer demand and external challenges, and pressures to be sustainable.
- Emerging technologies in biotechnology/bioproducts, digital manufacturing, automation, and data-intensive manufacturing processes continue to drive the transformation of the industry, and are resulting in a continued focus on product and process innovation, and collaboration across the value chain.
- Oshawa's advanced manufacturing sector has a diverse base serving aerospace, mining, nuclear, and energy sectors, supported by companies with global connections (e.g. GeoSight, P.R.



Engineering, Enable Interconnect), cutting-edge technology solutions (e.g. Cimetrix, Minacs), and business process improvement capabilities.

- Post-secondary and corporate assets offer the City a major opportunity to be a Provincially- and Nationally-recognized advanced manufacturing centre in all aspects of the sector, but particularly emerging technologies like additive manufacturing, advanced materials, robotics, technology integration, supply chain management, and bio-materials.
- There are strong opportunities for cross-sectoral synergies with energy, health, logistics, and ICT in Oshawa and across Durham Region, and opportunities to leverage bio-manufacturing opportunities based on agricultural assets in rural areas.
- Advanced manufacturing is strongly aligned with focus and support structures at Regional, Provincial, and Federal levels.

**Growth Prospects:** Sustained, but modest growth is expected in the advanced manufacturing over the shorter term, supported by new technologies/processes and new markets, while the traditional manufacturing sector will continue to restructure. Over the longer term, the greatest opportunities for success lie in harnessing technology, materials, and process innovations as emerging subsectors take hold.

**Target Opportunity:** Oshawa becomes a leader and Centre of Excellence in advanced manufacturing, with UOIT and Durham College acting as anchors to support a diverse base of technology-driven manufacturing companies.

**Notes of Caution:** The City's perception as an automotive manufacturing community overshadows internal and external awareness of the scale and scope of manufacturing activities and research and innovation occurring in the City. The City's positioning on the peripheries of the GTA and Eastern Ontario limit abilities to access programs and opportunities that are area-specific (e.g. EODP) or centred in Toronto. Competition for the City comes from the Greater Golden Horseshoe (e.g. Kitchener-Waterloo, Hamilton) and Southern U.S.

**Examples of Best Practice:** Advanced Manufacturing Research Centre in Sheffield (UK), Region of Waterloo Manufacturing Innovation Network (MIN).



FIGURE 7: ADVANCED MANUFACTURING SECTOR VALUE CHAIN

Companies		<b>Output and programs from:</b> <ul style="list-style-type: none"> <li>■ Universities: UOIT, University of Toronto Scarborough, University of Toronto, Ryerson, Trent</li> <li>■ Colleges: Durham, George Brown, Centennial, Seneca and Fleming</li> </ul> <b>Educational Programming:</b> <ul style="list-style-type: none"> <li>■ Durham College: 25 programs in engineering, trades, science and operations management</li> <li>■ UOIT: 36 programs, including: Masters/PhD - materials science; automotive and manufacturing engineering and electrical, and mechanical engineering programs; plus Graduate Diploma - Engineering Management</li> <li>■ A total of 248 programs in the region<sup>5</sup> comprised of 144 university programs in</li> </ul>
Natural Resources	GeoSight, P.R. Engineering, Rider Tool And Manufacturing	
Aerospace	Cleeve Technology Incorporated; Enable Interconnect	
Specialist	EHC Global, Premier Elevator, Nik Manufacturing, Intelligrated Canada; Velcan Forest Products. Jacklyn Industries	
Energy/Environment	Nu Flow Technologies, Lakeridge Precision	
Automotive/transportation	General Motors, Kerr Industries, Raglan Industries, A.G. Simpson Automotive, Tiercon Corp, Prime Railway Services	
Support Services		
Fabrication/machining	Steelhawk Plates & Profile, Machine & Tool Products	
Engineering & Technical Support	The PIC Group, Automotive Centre of Excellence (ACE) – testing facilities	
Technology Business Process Support	Cimetrix Solutions, Minacs, En-pro	
Logistics and Fulfillment	Syncreon, Pival	
Industry Associations - Regional	Ontario Aerospace Council (OAC), Aerospace Industries Association of Canada (AIAC), Automotive Parts Manufacturers Association (APMA), Society of Manufacturing Engineers,	
Industry Support	Canadian Manufacturers and Exporters, Colleges Ontario	

<sup>5</sup> For each of the industry value chains, the regional inventory of programs in the sector is defined by the educational institutions included in Appendix III.





	Network for Industry Innovation (CONII); UOIT- Commercialization office; The Ontario Partnership for Innovation and Commercialization	engineering, math and science, and 104 programs at community colleges in engineering, trades, science and operations management
Funding	Spark Angel Network	
<b>Education, Training and Human Resources Support</b>		<b>Emerging Workforce:</b> <ul style="list-style-type: none"> <li>■ UOIT: 2,209 graduates enrolled in engineering, mathematics, and physical science disciplines, with 137 in Masters programs</li> <li>■ 31,284 graduates enrolled in engineering, mathematics, other arts &amp; science, and physical science at regional universities, with 2,181 masters' students</li> </ul> <b>Existing Workforce:</b> <ul style="list-style-type: none"> <li>■ 578 graduates in engineering, mathematics, other arts &amp; science, and physical science, from local institutions</li> <li>■ Durham College: 308 graduates in engineering, trades, science and project management</li> <li>■ UOIT: 270 graduates in engineering, mathematics, other arts &amp; science, and physical science, with 71</li> </ul>
Local	Durham College School of Skilled Trades, Apprenticeship & Renewable Technology (START); School of Science & Engineering Technology (SET); UOIT – Faculty of Engineering and Applied Science, Faculty of Science	
Specialist programs	Automotive engineering program at UOIT, other electrical, mechanical, materials science programs at all levels at UOIT and Durham College.	
<b>Research and Development</b>		
Research Centres and Laboratories	General Motors of Canada's Canadian Engineering Centre UOIT: Automotive Centre of Excellence (ACE) The Robotics and Automation Laboratory (RAL), Advanced Materials Research Group, Scanning Electron Microscope (SEM) Lab; Durham College Integrated Manufacturing Centre (IMC) Trent University: Centre for Materials Research	
Networks of Centres of Excellence - National	AUTO21 Network of Centres of Excellence	
Research Support	DC @ CORE21, Durham College: Office of Research Services and Innovation (ORSI); UOIT The Office of Technology Transfer and Commercialization (OTTC)	





		<p>Masters' graduates</p> <ul style="list-style-type: none"><li>■ A pool of 5,590 graduates from regional universities</li><li>■ 1,883 graduates from colleges in the region</li><li>■ 3,707 graduates from Universities in the region, including 927 masters' graduates</li></ul>
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Sources: College data: College KPI data 2012, University: Common University Data (CUDO) Extracted from University Offices of Institutional Research and Analysis

## 4.2 Health and Bioscience

### 4.2.1 Labour Force and Business Trends

The health and bioscience industry is primarily composed of businesses in agriculture, manufacturing, professional services, and health care and social assistance. The health sector presents ample opportunities for growth due to the region's aging demographics, but also the opportunities to leverage traditional strengths in manufacturing and agriculture to support biotechnology and biosciences. Overall, Oshawa's labour force in health care and social assistance grew by 23% from 2006 to 2011, which was greater than the provincial rate of 13%.based on resident labour force.

Figure 8 outlines the composition of Oshawa's health and bioscience subsectors. There were 9,855 people in Oshawa that are employed in the health and bioscience industry in 2011, with the health and bioscience sector exhibiting a slightly lower than average concentration of resident labour force compared to the province. Proportionally, labour force in the health and bioscience sector in Oshawa is centred on health care and social assistance services. The subsectors with the highest LQ in 2011 included:



- Other ambulatory health care services<sup>6</sup> (1.86)
- Other chemical product manufacturing (1.73)
- Community food and housing, and emergency and other relief services (1.63)
- Child day-care services (1.30)
- Nursing and residential care facilities (1.27)

Hospitals (e.g. Lakeridge Health Oshawa) employed 25% of the workforce while nursing and community health and wellness services employed around 19% and 10% respectively. Subsectors outside of healthcare and social assistance employ a comparatively small portion of the labour force. The low labour force concentration in agriculture can be expected due to the urban nature of the City. The only exceptions to this trend were other chemical product manufacturing (LQ 1.73) and pharmaceutical and medicine manufacturing (LQ 1.20) which had high LQs based on resident labour force.

FIGURE 8: HEALTH AND BIOSCIENCE INDUSTRY PROFILE, CITY OF OSHAWA AND ONTARIO

Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
Total	0.93	Average	9,855	958,985	552	479	15.2%
1111 - Oilseed and grain farming	0.26	Low	245	85,685	6	2	200.0%

<sup>6</sup> Examples include ambulance services or blood banks.



Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
1112 - Vegetable and melon farming					2	0	N/A
1113 - Fruit and tree nut farming					0	0	N/A
1114 - Greenhouse, nursery and floriculture production					3	3	0.0%
1119 - Other crop farming					6	4	50.0%
1121 - Cattle ranching and farming					8	8	0.0%
1122 - Hog and pig farming					0	0	N/A
1123 - Poultry and egg production					3	2	50.0%
1124 - Sheep and goat farming					0	0	N/A
1129 - Other animal production					13	13	0.0%
1125 - Aquaculture	0.00	Low	-	260	1	1	0.0%
3112 - Grain and Oilseed Milling	0.00	Low	-	3,685	0	0	N/A
3113 - Sugar and Confectionery Product Manufacturing	0.83	Average	50	5,420	0	0	N/A
3114 - Fruit and Vegetable Preserving and Specialty Food Manufacturing	0.00	Low	-	6,500	0	0	N/A
3115 - Dairy Product Manufacturing	0.00	Low	-	9,745	0	0	N/A
3116 - Meat Product Manufacturing	0.13	Low	30	20,685	0	0	N/A
3117 - Seafood Product Preparation and Packaging	0.00	Low	-	585	0	0	N/A
3118 - Bakeries and Tortilla Manufacturing	0.33	Low	70	19,005	3	4	-25.0%
3119 - Other Food Manufacturing	0.41	Low	40	8,870	0	0	N/A
3121 - Beverage Manufacturing	0.36	Low	45	11,150	3	4	-25.0%
3251 - Basic Chemical Manufacturing	0.49	Low	35	6,395	0	0	N/A
3254 - Pharmaceutical and Medicine Manufacturing	1.20	Average	180	13,550	2	1	100.0%
3259 - Other Chemical Product Manufacturing	1.73	High	85	4,425	0	1	-100.0%



Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
3345 - Navigational, Measuring, Medical and Control Instruments Manufacturing	0.29	Low	35	11,025	2	2	0.0%
3391 - Medical Equipment and Supplies Manufacturing	0.43	Low	35	7,370	16	16	0.0%
4145 - Pharmaceuticals, toiletries, cosmetics and sundries merchant wholesalers	0.75	Average	155	18,490	4	4	0.0%
5417 - Scientific research and development services	0.40	Low	95	21,530	4	4	0.0%
5419 - Other professional, scientific, and technical services	0.80	Average	320	36,170	70	62	12.9%
6211 - Offices of physicians	0.87	Average	490	50,835	91	95	-4.2%
6212 - Offices of dentists	1.13	Average	515	40,910	74	75	-1.3%
6213 - Offices of other health practitioners	1.05	Average	590	50,710	96	64	50.0%
6214 - Out-patient care centres	0.65	Low	180	24,815	6	21	-71.4%
6215 - Medical and diagnostic laboratories	1.23	Average	170	12,415	9	10	-10.0%
6216 - Home health care services	1.23	Average	315	23,095	4	4	0.0%
6219 - Other ambulatory health care services	1.86	High	195	9,420	1	2	-50.0%
6221 - General medical and surgical hospitals	1.14	Average	2,485	196,795	2	1	100.0%
6222 - Psychiatric and substance abuse hospitals					0	0	N/A
6223 - Specialty (except psychiatric and substance abuse) hospitals					0	0	N/A
6231 - Nursing care facilities	1.27	High	1,840	130,710	5	7	-28.6%
6232 - Residential developmental handicap, mental health and substance abuse facilities					26	3	766.7%
6233 - Community care facilities for the elderly					3	0	N/A
6239 - Other residential care facilities					21	8	162.5%



Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
6241 - Individual and family services	0.99	Average	570	52,080	33	28	17.9%
6242 - Community food and housing, and emergency and other relief services	1.63	High	80	4,415	0	0	N/A
6243 - Vocational rehabilitation services	0.56	Low	50	7,970	8	6	33.3%
6244 - Child day-care services	1.34	High	955	64,270	27	24	12.5%

Source: Adapted from Statistics Canada, Census of Canadian Population, 2006 and Canadian Business Patterns Data, 2007 and 2011 by Millier Dickinson Blais, 2012

The total number of businesses in health and bioscience increased from 479 to 552 between 2008 and 2012. By number of firms, this industry is dominated by offices of other health practitioners (e.g. chiropractors, optometrists); other professional, scientific and technical services (e.g. veterinary medicine); and social assistance services. Each of these subsectors saw growth from 2008 to 2012. However community health and wellness-related delivery subsectors had some of the highest growth rates during this time period, focused on activities like vocational rehabilitation and nursing care. Oilseed and grain farming, pharmaceutical and medicine manufacturing, and general medical and surgical hospitals also exhibit high grow rates but they had a small number of establishments in 2008.

The strength of the health care and social assistance subsector presents opportunities for the City to encourage the growth of businesses that support and complement the direct provision of health and social assistance services. Developing the medical equipment manufacturing subsector would tie in with Oshawa's goal of growing its advanced manufacturing industry while taking advantage of the strength of the health care subsector. The integration of IT strengths into health and biosciences can assist with the growth of both sectors in the region, and alleviate challenges related to increasing efficiencies and cost effectiveness given declining budgetary resources. With growth of the biotechnology and pharmaceuticals activity in the City (primarily around the Lakeridge Health Education Research Network (LHEARN)), there may be opportunities to grow pharmaceuticals manufacturing and support innovation in the agricultural sector (e.g. nutraceuticals, biopharmaceuticals).



Finally the city has opportunities to pursue growth in health and social science education and research opportunities, due to the high number of firms engaged in healthcare and social assistance which all had positive rates of growth from 2008 to 2012. LHEARN continues to anchor research and educational opportunities in a range of health and biosciences sectors through a network of relationships with adjacent institutions (e.g. Queen's University's Family Medicine Residency program). However, the educational connections between UOIT and Durham College (e.g. nursing, social services) and major institutions like Waypoint Centre for Mental Health may encourage business activity or research connections in mental health, residential care, vocational rehabilitation, and home health care as well.

#### 4.2.2 Health and Bioscience Profile and Value Chain

Bioscience industries were examined together with traditional health care and social assistance activities in light of their potential relationships in areas like medical biotechnology, functional foods, and nutraceuticals/biopharmaceuticals. The resulting sector definition considers both traded (e.g. export-oriented) and population-related industries in the assessment of sector prospects for Oshawa, offering insight into a broad range of potential areas of investment attraction or cluster development activity based on both public and private sector assets. The following trends and highlights shape the City's opportunity in health and biosciences:

- The effects of Federal and Provincial government cost management initiatives continue to have an effect on the public health care industry, in terms of balancing access, quality, and appropriateness of care with cost pressures.
- Demographic changes and chronic disease rates are pushing the need for increases to health care productivity, technology integration in research and development, faster market entry, and the need for collaboration across value chains and international borders.
- Oshawa's education, research, and sector strengths in areas like family medicine, oncology, clinical trials/pharmaceuticals, bio/health informatics, and community health and wellness are driven by institutional assets (e.g. Lakeridge Health, Queen's, UOIT, Durham College), though there is a small base of private sector and corporate capabilities in medical devices.
- Opportunities to leverage activities at Lakeridge Health and other public institutions to support research and educational components of health and bioscience cluster development, as well as



leverage cross-sectoral opportunities based on corporate presence in advanced manufacturing of custom and niche products (e.g. Cleeve Technology) and transportation and logistics (e.g. Syncreon)

- City sits within the context of the fourth largest biotech and health research cluster in North America, with opportunities to leverage provincial and federal level programs and incentives, and local and regional education and research institutions to support fundamental and applied research and innovation.

**Growth Prospects:** Despite continued cost containment measures and difficulties in raising capital in innovative subsectors (e.g. biotechnology) technology-driven health care applications are expected to grow over the shorter term. Medium-term outlook is boosted by increased sales volumes and exclusivity for biologics, but continued cost containment in developed economies is expected to continue pressuring for product innovations and increased efficacy at lower costs.

**Target Opportunity:** Oshawa becomes a growing and innovative suburban health and bioscience cluster built on the strengths of Lakeridge Health and emerging research capacity.

**Notes of Caution:** The City's small corporate base, lack of external recognition of major assets (e.g. Lakeridge, UOIT), and prevailing perception as an automotive/blue collar community may limit growth of knowledge-based activity. Major life sciences clusters in Markham and Mississauga do not represent direct competition as a result of their scale, but other regional centres of health care delivery like Newmarket are building from a similar base in the sector.

**Examples of Best Practice:** Southlake Hospital and Venture Lab alliance in Newmarket, Mississauga UTM Academy of Medicine, Cluster Initiatives in Westchester (NY)/New Haven (CT), Central and South Florida centred on universities/incubators.



FIGURE 9: HEALTH AND BIOSCIENCES SECTOR VALUE CHAIN

Companies and Institutions		Education Programs, Existing and Emerging Workforce
Institutions	Lakeridge Health, RS McLaughlin Durham Regional Cancer Centre	<b>Output and programs from:</b> <ul style="list-style-type: none"> <li>Universities: UOIT, University of Toronto Scarborough, University of Toronto, Ryerson, Trent</li> <li>Colleges: Durham, George Brown, Centennial, Seneca and Fleming</li> </ul>
Community Health Care Delivery	Oshawa Clinic and Taunton Surgical Centre, Grandview Children's Centre, Enterphase Child and Family Services, Community Living Oshawa/Clarington, Cornerstone Community Association Durham, Home Instead Senior Care	
Medical Devices	MCM Biosciences, 5 Minds, Cleeve Technology	
Distribution	Syncreon, Pival	
Industry Support		<b>Educational Programming:</b> <ul style="list-style-type: none"> <li>Durham College: 22 programs including: Advanced diplomas in biomedical engineering technology, advanced biotechnology</li> <li>UOIT: 19 programs, including: Master of Health Sciences (MHSc) - Health Informatics, Master of Health Sciences (MHSc), bachelor programs combining both biological sciences and life sciences with management</li> <li>A total of 209 university programs in the region and 106 programs at community colleges covering health and biosciences</li> </ul>
Industry Associations - Local/Regional	Durham Radiology Association, Life Sciences Ontario, BioteCanada, IEEE Engineering in Medicine and Biology Society, MEDEC, COACH	
Industry Support	UOIT-Commercialization office; The Ontario Partnership for Innovation and Commercialization, Ontario Centres of Excellence (OCE), MaRS, Health Technology Exchange	
Funding	Spark Angel Network; Health Technology Exchange (HTX); Ontario Centres of Excellence; BioDiscovery Toronto; Canada Health Infoway (bio-informatics)	
Education, Training and Human Resources		<b>Emerging Workforce:</b>
Local	Lakeridge Health Education and Research Network (LHEARN); UOIT - Faculty of Health Sciences; Durham College-School of Health & Community Services; Queen's University Family Medicine Residency Program	
Specialist	School of Health & Community Services – Durham College UOIT/ provide Biotechnology, pharma, health care delivery	





programs	programs, bioinformatics Bio-engineering programs available regionally	<ul style="list-style-type: none"> <li>■ UOIT: 2,209 graduates enrolled in health and biosciences disciplines. 47 are in Masters programs.</li> <li>■ 34,823 graduates enrolled in health and bioscience disciplines in the region</li> </ul> <p><b>Existing Workforce:</b></p> <ul style="list-style-type: none"> <li>■ 869 graduates from local institutions</li> <li>■ Durham College: 575 graduates in health and biosciences disciplines</li> <li>■ UOIT: 294 graduates in health and biosciences disciplines 20 Masters graduates</li> <li>■ 12,104 regional graduate pool</li> <li>■ A total pool of 3,862 graduates from colleges in the region</li> <li>■ A pool of over 8,242 graduates from Universities in the region, including 986 masters graduates</li> </ul>
<b>Research and Development</b>		
Research Centres and Laboratories	Lakeridge Health Education and Research Network (LHEARN), Lakeridge Hospital Cancer Research Facility; UOIT: Health Education Technology Research Unit (HETRU); U of T, Scarborough Campus Departments of Biological Sciences, Psychology, Research; GTA region: 4th largest biotech /health research cluster in North America	
Networks of Centres of Excellence - National	Ontario Genomics Institute: Genome Canada;; Centre of Excellence in Personalized Medicine - Cepmed; Institute for Research in Immunology and Cancer – Commercialization of Research – IRICoR	
Research Support	DC @ CORE21, Durham College: Office of Research Services and Innovation (ORSI); UOIT The Office of Technology Transfer and Commercialization (OTTC)	

Sources: College data: College KPI data 2012, University: Common University Data (CUDO) Extracted from University Offices of Institutional Research and Analysis



## 4.3 Energy Generation

### 4.3.1 Labour Force and Business Trends

The energy generation industry is made up of businesses engaged in electric power generation and electrical equipment manufacturing, and support subsectors in construction and professional, scientific and technical services. The sector spans all types of generating capacity, from more traditional non-renewable resources (fossil fuels) to more renewable resources (wind, solar, geothermal).

FIGURE 10: ENERGY GENERATION INDUSTRY PROFILE, CITY OF OSHAWA AND ONTARIO

Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
Total	1.21	Average	4,660	345,925	475	470	1.1%
2211 - Electric power generation, transmission, and distribution	3.27	High	1,515	41,720	5	4	25.0%
2371 - Utility system construction	1.86	High	220	10,635	5	5	0.0%
2379 - Other heavy and civil engineering construction	0.00	Low	-	2,955	4	2	100.0%
2382 - Building equipment contractors	1.41	High	1,540	98,540	177	176	0.6%
3251 - Basic chemical manufacturing	0.49	Low	35	6,395	0	0	N/A
3336 - Engine, Turbine and Power Transmission Equipment Manufacturing	0.00	Low	-	2,240	3	3	0.0%
3353 - Electrical Equipment Manufacturing	1.46	High	120	7,395	1	1	0.0%
3359 - Other Electrical Equipment and Component Manufacturing	1.53	High	75	4,410	2	3	-33.3%
5413 - Architectural, Engineering and Related Services	0.68	Low	610	80,955	79	72	9.7%



Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
5416 - Management, scientific, and technical consulting services	0.50	Low	350	63,005	176	184	-4.3%
5417 - Scientific research and development services	0.40	Low	95	21,530	4	4	0.0%
8112 - Electronic and Precision Equipment Repair and Maintenance	1.47	High	100	6,145	19	16	18.8%

Source: Adapted from Statistics Canada, Census of Canadian Population, 2006 and Canadian Business Patterns Data, 2007 and 2011 by Millier Dickinson Blais, 2012

Figure 10 identifies 4,660 people employed in the energy generation industry in Oshawa. Relative to the rest of the province, Oshawa's labour force in energy generation is slightly higher than average, at an LQ of 1.21. Resident labour force in the sector was highly concentrated within:

- Electric power generation, transmission, and distribution (LQ 3.27)
- Utility system construction (LQ 1.86)
- Other electrical equipment and component manufacturing (LQ 1.53)
- Electronic and precision equipment repair and maintenance (LQ 1.47)
- Electrical equipment manufacturing (LQ 1.46)

Along with having the highest LQ, electric power generation, transmission and distribution is a major employer, with 33% of the energy generation labour force working in this subsector. Building equipment contractors and architectural, engineering and related services were also major sources of employment, with 33% and 14% of the energy generation sector labour force working in these subsectors in 2011. Overall, these subsectors benefit from the presence of the nuclear plants, as they are likely to provide support services to the plant, and the network of transmission and distribution systems in the region.

Business patterns data shows that from 2008 to 2012, the number of firms in the energy generation sector grew from 470 to 475. By share of total firms, this industry is mostly made up of businesses that provide support services, such as:



- Building equipment contractors (177)
- Management, scientific, and technical consulting services (176)
- Architectural, engineering and related services (79).

These three subsectors made up 77% of the City's businesses in the energy generation sector.

As noted previously, the overall growth of businesses in the energy generation sector was limited (1%) between 2008 and 2012. However at the subsector level, a number of subsectors that provide support to core energy generation firms grew over that time period:

- Other heavy and civil engineering construction
- Electric power generation, transmission, and distribution
- Electronic and precision equipment repair and maintenance
- Architectural, engineering and related services

When looking at the relative concentration of labour, labour force proportions and number of businesses, it appears that the Darlington and Pickering nuclear plants in Durham play an important role in driving business growth in the core and support areas of the energy generation industry. Overall, the presence of OPG translates into roughly \$100 million in annual expenditures across the region, in a wide range of sectors (e.g. environmental services, tools, general maintenance, building materials, or construction). The data revealed that there were high LQs for the manufacturing and construction subsectors, a large number of firms, and a large proportion of the labour force that work in professional, scientific and technical support services in energy generation. These subsectors mainly engage in support activities for the nuclear power stations and energy generation, transmission, and distribution infrastructure in the region, thus the plant's presence allows these businesses and work force to grow.

Based on the structure of the industry, the City has a broad opportunity in energy generation, particularly related to traditional fuel energy generation industries (e.g. nuclear), and the strong presence of complementary strengths in IT and advanced manufacturing. While the City's position in the energy generation sector is strong, particularly related to manufacturing and construction, it is strengthened considerably by the presence of core and supplier businesses and institutions across the rest of Durham Region (as suggested by the strong levels of employment among the resident labour force). In order to fully leverage labour force and business strengths, the City's prospects in energy generation seem tied in part to assisting with the development of a region-wide cluster.



### 4.3.2 Energy Generation Profile and Value Chain

There are a number of research and development, business support, and educational programs in Oshawa to support the energy generation sector. The City and Region have particular strengths in more traditional and proven forms of energy generation, as well as capabilities in manufacturing and construction sectors that expand opportunities in the sector across the value chain. There are a number of trends that should be highlighted in Oshawa's pursuit of energy generation activity:

- Natural gas-fired plants (based on lower costs, lower fuel prices, and shorter construction lead times than alternatives) and renewable-based resources like wind, solar, and biomass (based on targeted programs and policies) are expected to show the largest increases in capacity, in line with a projected 27% growth in Canada's capacity to 2035.
- Despite a declining share of total generation across Canada, nuclear and hydro-based generation are expected to grow to 2035.
- Increasing integration of more sustainable resources is driving smart grid technology development.
- Oshawa has major company representation in all types of traditional fuel energy generation, including OPG (nuclear, hydro, geothermal), Enbridge (natural gas), H2O Power (hydroelectric), and representation in sustainable energy solutions like Innovative Solutions (energy systems optimization), EV Fern (lithium batteries), and EN-pro (energy optimization).
- UOIT represents a leading energy research and development and education complex anchoring activity in geothermal, hydraulic, hydrogen, natural gas, nuclear, solar, wind, and geothermal, and emerging strengths at the intersection of energy and advanced manufacturing.
- Key part of the Regional energy generation and nuclear energy cluster as an educational and research leader.

**Growth Prospects:** Energy generation capacity is expected to increase in line with demand over the longer term, though longer term emphasis on gas plants to replace non-renewable coal capacity may temper nuclear growth.

**Target Opportunity:** Oshawa emerges as a key provincial energy generation cluster with diversity to match the provincial energy generation mix. The City's strength is anchored by a centre of excellence in energy and advanced manufacturing, with research capacity and corporate capabilities in sustainable energy, manufacturing, and professional services (e.g. engineering).



**Notes of Caution:** New companies in the nuclear supply chain may gravitate towards Darlington and Pickering. Durham Region’s profile in the energy sector is stronger than Oshawa’s profile. Notable competitors in Eastern Ontario (e.g. Peterborough, Port Hope), Kitchener-Waterloo, and Bruce County (e.g. Kincardine, Port Elgin), though some communities are not actively promoting their position.

**Examples of Best Practice:** University of Sheffield/University of Manchester Nuclear Advanced Manufacturing Research Centre in Sheffield (UK), Leadership Energy Carolinas, (NC, SC)

**FIGURE 11: ENERGY GENERATION SECTOR VALUE CHAIN**

Companies		Education Programs, Existing and Emerging Workforce
Utilities	Oshawa PUC Networks	<p><b>Output and programs from:</b></p> <ul style="list-style-type: none"> <li>Universities: UOIT, University of Toronto Scarborough, University of Toronto, Ryerson, Trent</li> <li>Colleges: Durham, George Brown, Centennial, Seneca and Fleming</li> </ul> <p><b>Educational Programming:</b></p> <ul style="list-style-type: none"> <li>Durham College: 2 specialist energy programs, including: renewable energy technician and energy management</li> <li>UOIT: 9 programs, the most comprehensive nuclear engineering programming in the region, including: bachelor/Masters/PhD – nuclear engineering, sustainable energy, and electrical, and mechanical engineering programs; plus Graduate Diploma - Engineering Management</li> </ul>
Power Generation	H2O Power, Enbridge, OPG	
Sustainable Energy	EV FERN, Innovative Solutions	
Energy Supply	Just Energy Group, En-pro	
<b>Support Services</b>		
Engineering & Technical Support	AMEC, Soil Engineers, D.G. Biddle & Associates, Geo-Logic. Proximity to major specialist nuclear engineering firms in Pickering; Automotive Centre of Excellence (ACE) testing facilities	
Infrastructure Support	D.M. Robichaud, Associates, Directional Cable Communications	
Manufacturing Support	Lakeridge Precision, Rider Tool And Manufacturing	
<b>Industry Support</b>		



Industry Associations - Regional	Organization of Canadian Nuclear Industries (CANDU), Canadian Nuclear Society, Canadian Nuclear Association, Ontario Energy Association, Association of Power Producers Ontario (APPrO), Ontario Power Authority	<ul style="list-style-type: none"> <li>■ A total of 19 programs in the region comprised of 12 university programs, and 7 programs at community colleges</li> </ul> <p><b>Emerging Workforce:</b></p> <ul style="list-style-type: none"> <li>■ UOIT: 2,467 graduates enrolled in agriculture &amp; biological Science, engineering, and physical science disciplines, with 146 in Masters programs.</li> <li>■ 37,997 graduates enrolled in engineering, mathematics, other arts &amp; science, and physical science at regional universities, with 2,319 masters' students</li> </ul> <p><b>Existing Workforce:</b></p> <ul style="list-style-type: none"> <li>■ 329 graduates in engineering, mathematics, other arts &amp; science, and physical science, from local institutions</li> <li>■ Durham College: 16 graduates in energy audit techniques</li> <li>■ UOIT: 313 graduates with 79 Masters' graduates</li> <li>■ A pool of 5,083 graduates from regional universities</li> <li>■ 41 graduates from colleges in the region</li> <li>■ 5,042 graduates from Universities in the region, including 927 masters' graduates</li> </ul>
Industry Support	Durham Strategic Energy Alliance, Spark Centre (Ontario Network of Entrepreneurs); Colleges Ontario Network for Industry Innovation (CONII) Oshawa Chamber of Commerce; UOIT-Commercialization office	
Funding	Spark Angel Network	
<b>Education, Training and Human Resources Support</b>		
Education Institutions	School of Skilled Trades, Apprenticeship & Renewable Technology (START) Durham College; UOIT – Faculty of Energy Systems and nuclear science, Durham Region Local Training Board	
Specialist programs	Energy management /renewable energy programs at Durham College; Undergraduate/graduate nuclear, energy systems programs at UOIT Environmental programs at Trent at Oshawa, U of T, Scarborough campus	
Recruitment	Adecco, Labor Ready, Kelly Services	
<b>Research and Development</b>		
Research Centres and Laboratories	UOIT: Energy Systems and Nuclear Science Research Centre (ERC): facilities in geothermal, hydraulic, hydrogen, natural gas, nuclear, radiation, solar and wind energy technologies; Clean Energy Research Laboratory (CERL) Durham College: Energy-neutral living laboratory for new technologies and education	





Networks of Centres of Excellence - National	UOIT, OPG members of The University Network of Excellence in Nuclear Engineering (UNENE)	
Research Support	DC @ CORE21, Durham College: Office of Research Services and Innovation (ORSI); UOIT The Office of Technology Transfer and Commercialization (OTTC)	

Sources: College data: College KPI data 2012, University: Common University Data (CUDO) Extracted from University Offices of Institutional Research and Analysis. Note: environmental programs are not split out in CUDO data

## 4.4 Multimodal Transportation and Logistics

### 4.4.1 Labour Force and Business Trends

Driven by globalization, rapid growth in international trade, and the shift in manufacturing to developing countries such as India and China, multimodal transportation and logistics has moved to the forefront of business functions in a number of more developed economies. Managing global supply chains has become crucial to success and innovation, and partnerships in transportation and logistics are a key enabler to this success. Further, outsourcing in multimodal transportation and logistics is increasing, with importance placed on collaboration and global connections. Traceability, security, and the management of global carbon footprints and inventories have also become important aspects of the transportation and logistics industry, which have driven innovations in information technology related to the sector.

On a more local level, transportation and logistics industries strengthen local industries and facilitate the movement of goods and services within the community, while also serving as an export driven industry in its own right by providing opportunities to coordinate and facilitate the movement of goods in global supply chains. Opportunities for growth in this industry in Oshawa exist due to local export orientated industries, and current and emerging major infrastructure facilities such as the Oshawa Municipal Airport, Port of Oshawa, Highway 401, and Highway 407 East.





FIGURE 12: MULTIMODAL TRANSPORTATION AND LOGISTICS INDUSTRY PROFILE, CITY OF OSHAWA AND ONTARIO

Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
Total	1.09	Average	2,795	230,415	244	252	-3.2%
4811 - Scheduled air transportation	0.49	Low	95	17,575	1	0	N/A
4812 – Non-scheduled air transportation	0.00	Low	-	2,705	2	2	0.0%
4821 - Rail transportation	1.72	High	185	9,680	1	1	0.0%
4831 - Deep sea, coastal and great lakes water transportation	0.00	Low	-	850	0	0	N/A
4832 - Inland water transportation	0.00	Low	-	155	0	0	N/A
4841 - General freight trucking	0.85	Average	570	60,340	126	150	-16.0%
4842 - Specialized freight trucking	1.31	High	320	21,935	32	26	23.1%
4881 - Support activities for air transportation	0.35	Low	40	10,275	7	6	16.7%
4882 - Support activities for rail transportation	3.10	High	75	2,180	0	1	-100.0%
4883 - Support activities for water transportation	0.00	Low	-	1,390	3	1	200.0%
4884 - Support activities for road transportation	0.79	Average	55	6,235	6	9	-33.3%
4885 - Freight transportation arrangement	1.48	High	290	17,590	9	8	12.5%
4889 - Other support activities for transportation	1.48	High	35	2,130	7	8	-12.5%
4911 - Postal service	0.87	Average	300	31,070	1	1	0.0%
4921 - Couriers	0.84	Average	205	21,905	31	17	82.4%
4922 - Local messengers and local delivery	0.75	Average	30	3,615	11	11	0.0%



Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
4931 - Warehousing and storage	2.58	High	595	20,785	7	11	-36.4%

Source: Adapted from Statistics Canada, Census of Canadian Population, 2006 and Canadian Business Patterns Data, 2007 and 2011 by Millier Dickinson Blais, 2012

Figure 12 shows that there were 2,795 people employed in the multimodal transportation and logistics industry in Oshawa in 2011, which represents a slightly higher than average concentration of labour force relative to the province. Proportionally, labour force in Oshawa's multimodal transportation and logistics sector is centred on support activities in transportation, warehousing and freight transportation. The top five subsectors based on labour force LQ in 2011 were the following:

- Support activities for rail transportation (LQ 3.10)
- Warehousing and storage (LQ 2.58)
- Rail transportation (LQ 1.72)
- Freight transportation arrangement (LQ 1.48)
- Other support activities for transportation<sup>7</sup> (LQ 1.48)
- Specialized freight trucking (LQ 1.31)

The warehousing and storage subsector recorded a high LQ and employed a large portion of the labour force in the industry at 21% in 2011. Other subsectors that employed a significant portion of the labour force were general freight trucking (20%), specialized freight trucking (11%), postal service (11%), and freight transportation arrangement (10%). In total, subsectors that were related to freight transportation employed around 41% of the local labour force, suggesting that the presence of major transportation infrastructure in the city, proximity to major transportation infrastructure in other parts of the GTA, and presence of export-oriented and goods-producing businesses in the City have driven employment and labour force growth in the sector.

The total number of businesses in the multimodal transportation and logistics sector declined by 3.2% from 2008 to 2012. At the subsector level, businesses that provide support activities or freight related

<sup>7</sup> Examples include crating and packing of goods, freight packing, or truck transportation brokers.



services experienced growth over the same time period. The following subsectors were the only ones to experience growth in the multimodal transportation and logistics sector from 2008 to 2012:

- Support activities for water transportation
- Couriers
- Specialized freight trucking
- Support activities for air transportation
- Freight transportation arrangement

It should be noted that though support activities for water transportation, support activities for air transportation, freight transportation arrangement recorded high growth rates since 2008, they remained comparatively small subsectors by number of businesses in 2012.

The data trends reveal that establishments that provide freight related services and support activities had high labour force LQs, employ a large portion of the labour force, and experienced high growth in the number of firms over the last several years. The warehousing and storage subsector was also found to have a high LQ and employ a large portion of the workforce. Overall, this suggests an emerging strength around transportation and logistics, in areas related to goods movement, as well as more technical areas of logistics. In order to encourage growth in these subsectors, investment will be needed in the City's infrastructure and major transportation assets to improve goods movement prospects. Further, stronger networks will need to be formed between export orientated industries and transportation and logistics firms and organizations across the region, including firms and organizations from outside of the GTA.

#### **4.4.2 Transportation and Logistics Profile and Value Chain**

Oshawa's multimodal transportation and logistics sector was examined within the context of an increasingly global supply chain, and the opportunities to leverage the growth of the sector across Canada and Ontario with the City's existing and emerging transportation assets in all four major modes (i.e. air, marine, road, and rail). In order to achieve that growth, there are a number of trends that should be noted:



- Accelerating globalization, sharp increases in international trade, technology advancement in supply chain management, and security concerns continue to drive investment and activity in transportation and logistics.
- Investment in distribution centres has increased dramatically in Canada since 2005 (particularly in Ontario) though increasing cost pressures have driven automation and efficiency enhancements, rather than employment growth.
- Global industry has been shaped by growth of intermodal and container transportation and strategic outsourcing of logistics (e.g. customs clearance, brokerage services, and rail services).
- Oshawa's transportation infrastructure has infrastructure in all four major modes, and is supported by a corporate base that includes headquarter and major operations for logistics, freight forwarding, fulfillment, sub-assembly, and warehousing companies.
- Existing assets may offer opportunities in emerging areas of activity, such as short-sea shipping along Great Lakes-St. Lawrence Seaway.
- Academic programming and research capacity in the City has interests in supply chain management, and commercially-oriented IT faculty at local post-secondary institutions may represent opportunities for growth in IT-enabled goods movement.
- Regional population growth and base of globally connected firms in sectors like advanced manufacturing and health and bioscience offer support to the development of the local sector.

**Growth Prospects:** Demand for supply chain efficiency and globalization will continue to transform the sector over the short term, driving growth of IT and supply chain management, but opening up SMEs (particularly trucking) to acquisition or failure. Though escalating costs, industry restructuring, or government protectionism could cause retrenchment, growth trends are expected to continue – perhaps as a result of new trade agreements (e.g. CETA).

**Target Opportunity:** Oshawa becomes an integrated regional logistics and distribution hub working in tandem with the activities of larger centres in the GTA, and a critical component in the regional supply chain that enables economic development across Durham Region.

**Notes of Caution:** The City has no current profile as a multimodal logistics hub, and is in close proximity to more internationally-recognized hubs in York and Peel Regions. Further, there is uncertainty around expansion of some assets, and the existing transportation infrastructure does not have the coordination among the multiple modes and assets to operate as seamlessly as a true multimodal hub. The City of Hamilton represents a major emerging local competitor based on



organizational linkages (e.g. TransHub Ontario) and multimodal assets, and Halton Region (particularly Milton and Halton Hills) has experienced rapid sector growth based on transportation connections.

**Examples of Best Practice:** AllianceTexas (TX), Raritan Centre Freight Village (NJ), Metro-Atlanta Supply Chain Leadership Council (GA)

**FIGURE 13: MULTIMODAL TRANSPORTATION AND LOGISTICS VALUE CHAIN**

Companies		Education Programs, Existing and Emerging Workforce
Distribution Centres	Canada Post, Pival (dedicated warehousing)	<p><b>Output and programs from:</b></p> <ul style="list-style-type: none"> <li>Universities: UOIT, University of Toronto Scarborough, University of Toronto, Ryerson, Trent</li> <li>Colleges: Durham, George Brown, Centennial, Seneca and Fleming</li> </ul> <p><b>Educational Programming:</b></p> <ul style="list-style-type: none"> <li>Durham College: 13 programs covering computer science and business, including operations management and project management</li> <li>UOIT: 15 programs, including combined ICT and management programs at bachelors', masters, and doctorate level</li> <li>A total of 190 programs in the region comprised of 90 university programs, and 100 programs at community colleges</li> </ul> <p><b>Emerging Workforce:</b></p> <ul style="list-style-type: none"> <li>UOIT: 2,131 graduates enrolled in computer science, business and mathematics, with 59 in</li> </ul>
Multimodal Logistics	TFI Holdings Limited Partnership (Transforce), Canada Cartage, Caltrans Logistics, Pival, Mackies Moving Systems, Syncreon. Over 35 small trucking and freight companies	
Air	AirExpress, Enterprise Airlines	
Marine	QSL: Oshawa Stevedoring	
Rail	CP, Via Rail	
<b>Support Services</b>		
Manufacturing support	Cleeve Technology, Enable Interconnect, Prime Railway Service, Raglan Industries	
Multimodal Logistics	Minacs, Transport Towing, Earle's Mobile Mechanics	
Air	NAV Canada, TAAS Limited, Angels of Flight, Enterprise Airlines, Canadian Flight Academy, Corporate Aircraft Restorations, Aviation Supplies, Pilot Insurance Company, Canada	



	Border Services Agency. Durham Flight Centre	<p>Masters programs.</p> <ul style="list-style-type: none"> <li>26,337 graduates enrolled in Business &amp; Commerce, Computer Science and Mathematics programs at regional universities, with 1,817 masters' students</li> </ul>
Marine	COMRA Marine Rescue Association, Pilot Insurance Company	
Rail	CN, GO Transit Maintenance Facility, Nordco, Auto Warehousing Company	
<b>Industry Support</b>		<p><b>Existing Workforce:</b></p> <ul style="list-style-type: none"> <li>461 graduates in mathematics, information technology and business disciplines from local institutions</li> <li>Durham College: 139 graduates in information technology and business disciplines</li> <li>UOIT: 322 graduates with 14 masters' graduates</li> <li>A pool of graduates from regional universities</li> <li>2,399 graduates from colleges in the region in logistics supply chain, business, and computer science</li> <li>5,174 graduates from Universities in the region, including 819 masters' graduates</li> <li>Sources</li> <li>College data: College KPI data 2012</li> <li>University: Common University Data (CUDO) Extracted from University Offices of Institutional Research and Analysis</li> </ul>
Industry Interest Groups/Associations	HwyH2O, Canadian Supply Chain Sector Council, Supply Chain and Logistics Association of Canada	
Industry Interest Groups/Associations – Regional	Canadian International Freight Forwarders Association – CIFFA (Toronto) The Logistics Institute (Toronto), Canadian Society of Customs Brokers (Ottawa) Ontario Trucking Association (Toronto), Canada Border Services Agency (CBSA) The Association of Operations Management	
<b>Education, Training and Human Resources Support</b>		
Local	UOIT, Durham College, Corporate Training Services (CTS), Trent at Oshawa	
Regional	University of Toronto (Scarborough), Trent University, Ryerson University, George Brown College, Seneca College, Centennial College, Fleming College	
Specialist programs	UOIT MBA program - Marketing and Logistics and Supply Chain Management option; Operations Management at Durham College, diploma, certificate program in logistics, supply chain, purchasing, trade, available at	



	Fleming, Centennial, Seneca, George Brown Colleges	
Specialist training - regional	Canadian Institute of Traffic and Transportation (CITT) - Toronto FITT (Forum for International Trade Training) (Ottawa)	
Recruitment	StaffPlus, Adecco, Labor Ready, Kelly Services	
<b>Research and Development</b>		
Local	UOIT Faculty of Business and Information Technology - published research on supply chain topics	

Sources: College data: College KPI data 2012, University: Common University Data (CUDO) Extracted from University Offices of Institutional Research and Analysis

## 4.5 Information Technology

### 4.5.1 Labour Force and Business Trends

Though Oshawa's presence of pure information technology sector employment and businesses is limited, the presence of complementary professional services industries in the City suggests opportunities to drive business activity and growth in niche areas of IT like business process improvement, particularly over the longer term. The industry is focused on the adaptation of advanced information technology to increase efficiency, productivity, and quality.

Figure 14 shows that there were 1,815 people employed in the information technology sector in 2011, with the sector having a low-average relative concentration of labour force compared to the province. The business support services (e.g. telephone call centres, businesses service centres) subsector was the only one to exhibit a high concentration of labour force in the region (LQ 1.96) when compared to the rest of the province in 2011. Although the business support services subsector has a lower concentration of labour when compared to the province, this subsector employs around 50% of the local work force in the information technology sector. Computer systems design and related





services was also another major source of employment as 31% of the information technology labour force works in this subsector

FIGURE 14: INFORMATION TECHNOLOGY PROFILE, CITY OF OSHAWA AND ONTARIO

Industry	Labour Force				Business Patterns (Total)		
	2011 LQ	Classification	Oshawa 2011	Ontario 2011	2012	2008	%Change
Total	0.75	Average	1,815	217,165	346	352	-1.7%
5112 - Software Publishers	0.00	Low	-	11,140	2	1	100.0%
5415- Computer Systems Design and Related Services	0.50	Low	565	101,745	129	136	-5.1%
5416 - Management, Scientific, and Technical Consulting Services	0.50	Low	350	63,005	176	184	-4.3%
5614 - Business Support Services	1.96	High	900	41,275	39	31	25.8%

Source: Adapted from Statistics Canada, Census of Canadian Population, 2006 and Canadian Business Patterns Data, 2007 and 2011 by Millier Dickinson Blais, 2012

There was a 2% decline in the number of information technology sector businesses in the City of Oshawa between 2008 and 2012. Despite the overall decline, the sector experienced growth in software publishers (100%) and business support services (26%). Software publishers (e.g. Salentica) remained a small subsector in 2012 though. Although there were slight declines in the management scientific and technical consulting services and computer systems design and related services subsectors, these two subsectors make up 51% and 37% of the businesses in the City's information technology sector respectively.

As a result, the City maintains an emerging competitive positioning in this sector based on niche strengths in IT deployment among other sectors, and professional services consulting. Over the longer term, and through engagement with the existing corporate base (e.g. Minacs), the City can





build a stronger positioning based on business and labour force strengths that may re-engage the area's IT labour force and business base.

#### 4.5.2 Information Technology Profile and Value Chain

Activity in the City's information technology sector is primarily driven by deployment of IT into other sectors, and integration with professional services consulting activities. Though the City has access to notable education and research assets in the sector, the majority of the sector has developed as locally-facing, developing and deploying niche applications and solutions in other business sectors. There are several considerations to be made in the further development of Oshawa's IT sector:

- Big data continues to drive innovation, competitiveness, and productivity in the sector and related business sectors (e.g. finance, government, health care).
- IT businesses continue to blur sector lines and boundaries through integration with other business sectors, while rationalization and consolidation, mergers and alliances, out-sourcing and off-shoring, security concerns, and polarization of IT skills continue to shape the sector.
- A significant share of Oshawa's IT capacity is deployed in other sectors like advanced manufacturing (e.g. Cimetrix), automotive (e.g. Minacs), energy (e.g. innovative solutions), and logistics (e.g. Syncreon).
- Research activity at UOIT is focused on notable growth areas (e.g. security, health informatics, data processing), while the University employs a unique and integrated business/IT faculty to support the development of entrepreneurial and business skills.
- Regional innovation and industry support organizations have supported spin-off companies in IT.

**Growth Prospects:** Positive prospects for the industry, as new and improved business processes are demanded by a range of sectors. This will increasingly blur the lines between IT and other sectors. Rapid innovation and sector convergence is expected to continue driving entrepreneurship in niche areas. Similar trends are expected to continue over the medium-term, though the significance and influence of emerging markets is expected to increase.

**Target Opportunity:** Oshawa's IT sector becomes a strong enabler that facilitates the growth of other business sectors through continued adoption and deployment of key technologies. Practical education attributes of UOIT and Durham College continue to support a strong entrepreneurial culture and talent development infrastructure in IT growth areas.



**Notes of Caution:** Based on the hidden nature of IT activity and companies within other business sectors, there is an external lack of awareness of the City’s capabilities. Further, the perception of the City as an automotive/blue collar community may not support the attraction of knowledge-based industries. Though head-on competition with adjacent areas like Mississauga and Markham can be avoided based on the nature of the local sector, Kitchener-Waterloo and Hamilton have emerging strengths in areas of IT-enabled business development, and entrepreneurial support.

**Examples of Best Practice:** Communitech in Waterloo Region, Stanford University/Silicon Valley (CA)

FIGURE 15: INFORMATION TECHNOLOGY SECTOR VALUE CHAIN

Companies		Education Programs, Existing and Emerging Workforce
Business Process Improvement	Minacs, Innovative Solutions	<p><b>Output and programs from:</b></p> <ul style="list-style-type: none"> <li>Universities: UOIT, University of Toronto Scarborough, University of Toronto, Ryerson, Trent</li> <li>Colleges: Durham, George Brown, Centennial, Seneca and Fleming</li> </ul> <p><b>Educational Programming:</b></p> <ul style="list-style-type: none"> <li>Durham College: 10 programs covering computer programming, web design, mobile computing, business</li> <li>UOIT: 15 programs, including software engineering, network engineering, combined ICT and management programs, Master of Information Technology Security - (MITS)</li> <li>A total of 172 programs in the region comprised of 88 university programs, and 84</li> </ul>
ICT Consulting, Services SMEs	Three Wise Men, Compute, plus local web hosting, graphic design companies	
Hardware manufacture	I-Tec Electronics	
Advanced Manufacturing	Cimetrix Solutions	
Energy	Innovative Solutions	
Logistics	Pival, Syncreon eCommerce order fulfillment	
<b>Industry Support</b>		
Local Industry support groups	Spark Centre (Ontario Network of Entrepreneurs); Colleges Ontario Network for Industry Innovation (CONII) Oshawa Chamber of Commerce; UOIT-	



	Commercialization office; Durham IT Association	<p>programs at community colleges</p> <p><b>Emerging Workforce:</b></p> <ul style="list-style-type: none"> <li>■ UOIT: 2,131 graduates enrolled in computer science, business and mathematics, with 59 in Masters programs.</li> <li>■ 26,337 graduates enrolled in Business &amp; Commerce, Computer Science and Mathematics programs at regional universities, with 1,817 masters' students</li> </ul>
Industry support groups – regional	Ontario Centres of Excellence (OCE), MaRS	
Associations - regional/national	Canadian Information Processing Society (CIPS) National CATAAlliance Information Technology Association of Canada, Interactive Ontario, Toronto	
Funding	Spark Angel Network	
<b>Education, Training, and Human Resources Support</b>		
Local	UOIT Faculty of Business and Information Technology, Durham College School of Business, IT & Management (BITM) Trent at Oshawa	<p><b>Existing Workforce:</b></p> <ul style="list-style-type: none"> <li>■ 461 graduates in mathematics, information technology and business disciplines from local institutions</li> <li>■ Durham College: 139 graduates in information technology and business disciplines</li> <li>■ UOIT: 322 graduates with 14 masters' graduates</li> <li>■ A pool of 7,503 graduates from regional universities</li> <li>■ 2,329 graduates from colleges in the region</li> <li>■ 5,174 graduates from Universities in the region, including 819 masters' graduates</li> </ul>
Specialist Programs	Information security, health informatics, game development/entrepreneurship	
Regional	University of Toronto (Scarborough), Trent University, Ryerson University, George Brown College, Seneca College, Centennial College, Fleming College	
<b>Research and Development</b>		
Local	UOIT: Research Groups: METIS Information Security, Digital Life, Distributed and Mobile Systems Laboratory. Various areas of communications systems research, information systems, educational informatics, health informatics, a Research Labs: Advanced User Interfaces and Virtual Reality, Hacker, Health Informatics, 2 Canada Research Chairs.	
Networks of Centres of Excellence -	UOIT member of Shared Hierarchical Academic Research Computing Network (SHARCNET)	



National		
Research Support	DC @ CORE21, Durham College: Office of Research Services and Innovation (ORSI); UOIT The Office of Technology Transfer and Commercialization (OTTC)	
Regional	The Privacy and Cyber Crime Institute, Knowledge Media Design Institute, Department of Computer Science – Research Groups Centre for Quantum Information and Quantum Control University of Toronto; Institute of Innovation and Technology Management (IITM); The Rogers Communications Centre Ryerson University	

Source: College data: College KPI data 2012, University: Common University Data (CUDO) Extracted from University Offices of Institutional Research and Analysis

## 4.6 Key Themes

Since 2008 the City has experienced significant growth with expansion of the education and the health care sectors. This together with an established energy sector, and emerging industries in logistics and ICT, has resulted in a more diversified economy. Backed by a supportive policy environment, the City is now poised to build on these accomplishments and take its sectors to the next level. The combination of potentially transformative opportunities in each sector and the significant synergies between them can create a technology driven economy and maximize the City's potential. These opportunities now need to be harnessed into active and vibrant sector communities driven by innovation. The following over-arching themes have emerged from the target sector analysis.



## **Transformative Opportunities**

Sector opportunities are potentially transformative:

- Health - the potential satellite inter-professional research centre as part of Lakeridge Health's strategic objectives can be a catalyst for future growth
- Advanced Manufacturing - the evolution of UOIT and Durham College into an advanced manufacturing national centre of excellence can position Oshawa as a national leader in the field
- Energy - Oshawa's role as part of a regional energy cluster can be elevated through the integration of energy into a national advanced manufacturing centre of excellence
- Logistics - Oshawa's transportation attributes can underpin a regional multimodal logistics hub, driving economic growth in the region
- ICT - the sector's role as a key enabling sector that adds value and drives growth in other sectors can generate new companies

## **Research and Development Capacity is a Growth Driver**

Oshawa's research and development capacity at UOIT, Durham College, and Lakeridge Health are platforms for sector development across the board:

- Opens up new and emerging technology areas that are predicted to grow
- Provides opportunities for sector development and growth
- Outweighs the commercial base in health and information technology

With the potential for an Advanced Manufacturing Centre, Oshawa's research and development facilities can become a centre of gravity for the City along the lines of best practice models like Communtech, in Waterloo Region, and the Advanced Manufacturing Research Centre in Sheffield (UK).

This latter idea is being put forward by the Organization of Canadian Nuclear Industries for a facility at UOIT as part of a nuclear centre of excellence, which was presented to Oshawa Chamber in November 2013.

## **Strength in Education Programming**

Oshawa has considerable education programming strengths in ICT, health and bio-sciences, advanced manufacturing, energy and business management. Only a relatively small augmentation is



required through broader provision of specialist logistics programs at diploma and undergraduate level.

Oshawa's institutions turn out industry ready graduates through integrated programming modules that connect management with such disciplines as ICT, engineering and health sciences.

### **Oshawa's Sectors are Synergistic**

There are key synergies between all sectors with potentially more convergence opportunities. All the target sectors are important enablers in their own right:

- The ICT sector draws its capabilities from applications in Oshawa's multimodal logistics, life sciences, and advanced manufacturing sectors
- Oshawa's business markets and supply chains are regional, national, and global, in which multimodal logistics is critical
- Utilization of agricultural bio-materials in manufacturing products represents a potential growth area
- Manufacturing businesses provide medical devices products and deploy ICT technologies around process improvement
- Manufacturing is key to energy supply chains

### **Operational Excellence through Business Process Improvement**

There is a significant group of professional services firms providing business process improvement services. Driven by innovation and technology intensive, these firms are platforms for growth in the ICT sector.

### **Technology Innovation**

Oshawa is in a position to capitalize on technology trends through its company base as well as its research and development institutions. Cutting edge technology applications are being deployed by relatively new businesses and the long established alike; from Cimatrix and Innovative Solutions to General Motors.



### **Globally Connected Businesses**

Oshawa's companies serve global markets in the developed and emerging economies with wide reaching supply chains.

### **Diversification**

Oshawa's manufacturing sector has diversified into growth markets such as resources and energy, with a raft of companies providing specialty products that are leaders in their field.

### **Polarization of Company Size**

A few large companies and many small ones characterize Oshawa's business base, with not much at the medium-size range, offering opportunities to target support at the growth of smaller companies.

### **Hidden Gems**

Oshawa's considerable strengths in research and development, its hospital, technological innovation in companies, and diversity of its manufacturing sector are relatively unknown. Communications campaigns around these attributes as part of the sector development strategies is important.



## 5 SWOT Analysis

An important consideration in any target sector or cluster development strategy work is the opinions and thoughts of business and industry leaders that already operate within a jurisdiction. These individuals can provide an excellent source of up-to-date information or perceptions as it relates to an area's strengths and weaknesses, as well as the opportunities and threats that may be confronting specific industry sectors or the region as a whole, in the pursuit of business attraction and retention.

A SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis provides further indication of the City's ability and capacity to support economic growth opportunities in the target sectors. The SWOT considers the results of the background review and industry analysis, coupled with input from local stakeholders within the City of Oshawa and Region of Durham. For the purposes of this report, a SWOT is characterized in the following terms:

- **Strengths (Positive, Internal):** Positive attributes or assets currently present in Oshawa, particularly in comparison to the broader region and Ontario.
- **Weaknesses (Negative, Internal):** Local issues or characteristics that limit the current or future growth opportunities for Oshawa.
- **Opportunities (Positive, Internal and External):** Areas where Oshawa can remedy its weaknesses (e.g. learning from others, provincial assistance, strategic initiative, aggressive marketing, targeted investment).
- **Threats (Negative, Internal and External):** Trends that threaten Oshawa's future and attractiveness to new industry, including local weaknesses, or global changes in consumer demand and industry performance.





FIGURE 16: MAPPING THE SWOT ANALYSIS

	Helpful	Detrimental
Internal	<b>Strengths</b>	<b>Weaknesses</b>
External	<b>Opportunities</b>	<b>Threats</b>

The SWOT analysis that follows provides insight into the challenges and opportunities for Oshawa in its efforts to generate and sustain economic development and cluster activity around its key economic sectors.



Strengths	Weaknesses
<ul style="list-style-type: none"> <li>■ Capable and available workforce able to produce quality products under pressure; strong work ethic</li> <li>■ Strong based of companies in manufacturing support subsectors</li> <li>■ Pro-active economic development department and supportive Mayor and City officials</li> <li>■ Presence of the most comprehensive engineering centre in Canada (Canadian Engineering Centre)</li> <li>■ Presence of modern and innovative assets in health and biosciences with a worldwide reputation (Lakeridge Hospital and Lakeridge Health Education Research Network, Queen’s University)</li> <li>■ Pro-active physician recruitment program at Lakeridge</li> <li>■ Strong and unique IT programs at post-secondary institutions</li> <li>■ Strong regional education and innovation assets: UOIT, Durham College, Nuclear Research Centre, Spark Centre, Durham Strategic Energy Alliance</li> <li>■ Local transportation network assets in all four modes</li> <li>■ Recognized regional presence as an energy generation hub - Durham produces 30% of Ontario’s energy</li> <li>■ Major recent investments in capacity and production among leading advanced manufacturing firms (e.g. GM has invested millions of dollars in retrofitting its plant in Oshawa and expects record sales this year)</li> <li>■ Presence of most sophisticated climactic wind tunnel in the world (ACE at UOIT)</li> </ul>	<ul style="list-style-type: none"> <li>■ Region is perceived as not as ‘open for business’ as claims suggest</li> <li>■ Logistical challenges associated with being on the ‘wrong’ side of GTA – competition from major transportation and logistics hubs in western GTA</li> <li>■ Weak existing connections between employers and post-secondary institutions, from employer perspective</li> <li>■ Little recognition of opportunities for innovation and business development around the Pan Am games in 2015</li> <li>■ More government funding programs available in adjacent Eastern Ontario; lack of access to programs outside of GTA</li> <li>■ Trouble sourcing workers with capabilities to support company growth in new and emerging business sectors</li> <li>■ Limited, but growing, local base of IT and life sciences firms</li> <li>■ Lack of comparative profile or critical mass to anchor cluster development initiatives at the local level</li> <li>■ Physical and political constraints and uncertainties related to air and marine transportation expansion</li> <li>■ Blue collar image does not mesh with knowledge industries</li> <li>■ Aesthetics around community gateways (e.g. Highway 401 ramps) give a poor first impression</li> </ul>
<ul style="list-style-type: none"> <li>■ Ability to access major capital projects over the next 10 years (e.g. refurbishment/decommissioning of nuclear</li> </ul>	<p data-bbox="1079 1312 1986 1351"><b>Threats</b></p> <ul style="list-style-type: none"> <li>■ High business costs compared to other parts of North America, particularly U.S. states offering incentives to</li> </ul>



<ul style="list-style-type: none"><li>plants, updates to the transmission grid in Toronto)</li><li>■ Attraction of companies from within the energy generation value chain to locate in Oshawa, as a gateway to North American markets</li><li>■ Existing R&amp;D and education capacity represent growth platforms</li><li>■ Diversification of advanced manufacturing subsectors into new markets</li><li>■ Projected growth in ageing population creating demand for health services</li><li>■ Growth forecasts that place Durham Region as one of the fastest growing regions in the GTA to 2032</li><li>■ Local IT sector is a focus for regional investment attraction and technology integration</li><li>■ Dedicated regional economic development interest and prioritization of agriculture and agri-business programming</li><li>■ Regionally-coordinated and communicated branding for Durham Region</li><li>■ Development of Durham Energy Cluster (based on technology in region, educational institutions, companies, government policies)</li></ul>	<ul style="list-style-type: none"><li>relocate</li><li>■ Closure of GM Impala production line in 2016</li><li>■ Lack of funding and government support for service delivery, research, and innovation in the health sector</li><li>■ Loss of IT and other knowledge-based workforce to other areas of the GTA</li><li>■ Relative decline in importance of nuclear generated energy in favour of natural gas</li><li>■ Nuclear refurbishment supply chain already in place in adjacent areas, other areas of Ontario</li><li>■ Persistence as a GTA bedroom community, fuelled by cheap housing (similar to Barrie)</li></ul>
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## 6 Cluster Development Strategy

Supporting or pursuing investment in target sectors is based on the assumption that industry groups together in nodes of concentration. These nodes typically appear in areas where resources are most densely concentrated – where talent, infrastructure, financial capital, and enabling policies combine to offer a compelling case for development and investment.

Initially, the term cluster was applied to large and significantly resourced industry concentrations. More recently though, the term has been used by economic development practitioners to explain the



broad range of structural relationships needed to grow local economies, by building on areas of concentration and interconnectedness within their own community and sectors of specialization.

This activity – while not clustering in a traditional sense – has proven highly effective in a range of jurisdictions. It represents a significant shift in economic development thinking, as it suggests that a range of local and regional actors – not just the business community – play a critical role in driving economic growth in target sectors. It is not just the business community that determines competitiveness and sector growth prospects, but the local and regional factors external to the business community as well.

This more holistic, or cluster-based view of a sector requires a different model for assessing target sectors and developing strategies. The model must identify the core set of firms that make up the traditional sector, but also the range of closely related suppliers, service-sector support business, and enabling infrastructure (e.g. policies, organizations, and educational research institutions) that can drive the growth of the sector, as outlined in Section Three of this report.

Strategies for supporting the development of these holistic clusters must build on the sector-based analysis and definitions outlined above, and align resources, organizations, and businesses under a common vision for economic and business development. In the case of Oshawa, this includes support for sectors like advanced manufacturing, health and biosciences, energy generation, multimodal transportation and logistics, and information technology, where the city and province have well-established sector-based business and institutional assets that can underpin the development of the of industry clusters.

It also includes support for the infrastructure and programs that span all economic sectors, and allow for the interaction and idea generation that occurs when highly innovative firms and entrepreneurs encounter each other. In recent years, this perspective has encouraged communities and governments at all levels to construct a range of programs and facilities designed to proactively nurture and encourage cross-sectoral collaboration and broad-based industry impact (e.g. innovation councils, incubator facilities). There are key opportunities for Oshawa to do the same, through the development of new facilities and programs that counter the often silo-based thinking of traditional economic development programming, improve prospects for cross-sectoral collaboration, and ensure business support programs and services are available to all firms and entrepreneurs in the City, regardless of sector.



The most successful frameworks for supporting cluster development are community-based, with the ability to draw on the expertise and connections of other organizations internal and external to the community to achieve the vision for development. It should be reflective of local context and perceptions among the key players in the region, as well as local assets and gaps in the community, but also seek to integrate the leading practices from organizations and businesses most relevant to the community's aspirations.

Given this insight, and the City's local context and sectors of opportunity, Oshawa needs to consider a multi-sector focus for its investment attraction, business development, and job growth goals, which includes sector-specific tactics and broader strategies that can support outcomes across all sectors. The components of this already exist, but the coordination of these resources into a more effective environment for supporting business development, particularly in the city's revised target sectors, is needed.

## 6.1 Action Plan

The action plan below is divided into sectors, where appropriate, as well as cross-sectoral initiatives that have impacts on the cluster development and investment attraction activities of more than one sector. The action plan is meant to reflect a number of components:

- Key target sub-sector opportunities and strategic directions, as outlined in the target sector work
- Key tenets of Oshawa's sector strengths and opportunities, as they relate to value propositions or marketing messages
- Required marketing activities to underpin investment attraction in the sector
- Labour force development initiatives to access emerging opportunities, or address existing skill gaps

The implementation of the cluster development strategy will rely heavily on the partnership opportunities that emerge between the local municipality, local business community, and range of sector-specific and government organizations that can assist with the growth of the target sector in Oshawa. In addition to outlining the role of the City of Oshawa, the action plan highlights partnership opportunities at the local, regional, and national level intended to assist with the implementation of the action, as well as potential sources of funding and assistance that may be available to the City or other partners (e.g. institutions, businesses, organizations) to undertake initiatives.



In order to assist the City in developing annual business plans, and reflective of the fact that not all of the recommended strategies and initiatives can be pursued at once, actions are prioritized as high, medium, or low. With that prioritization, a timeframe (short, medium, or long term) is offered for each action. This timeframe builds on the notion that the development of a cluster can be a time consuming or resource-intensive process, especially in cases where a sector represents a more nascent or emerging strength for a community. Indeed, many of these actions will need to be pursued over the longer term – likely more than five years in some cases. The timeline for each action of the strategy provides the City and its economic development partners an indication of the time horizon over which effort is needed to achieve the action, or over which positive outcomes may emerge.

Understanding that effective strategies measure their success and communicate results of activity, each set of actions is assigned a set of key performance indicators or metrics which may be used to assess progress on the implementation of the proposed actions.



## Cross-Sectoral Initiatives

Required Actions	Priority & Timeline	Role of Oshawa	Potential Partners	Performance Measures
<p>1. Work with SPARK and ONE to build out local connections to the emerging regional and provincial innovation ecosystem, and source resources available through ONE partners (e.g. OCE, SBECs, MaRS)</p> <p>1.1. Develop an online and print client/business pathways tool, which identifies physical and virtual business supports available at each stage of company maturity in Durham Region/Ontario</p>	<p>High priority</p> <p>Short term</p>	Lead/Partner with SPARK	Spark, ONE, Durham Region, MRI, MEDTE, Business Advisory Centre Durham, OCE	<p>Advanced Manufacturing facility and capital funding attracted from other levels of government</p> <p>Number of knowledge-based company inquiries</p>
<p>2. Based on best practice models, develop an Advanced Manufacturing Research Centre at UOIT that incorporates:</p> <ul style="list-style-type: none"> <li>■ Advanced apprenticeship/training opportunities</li> <li>■ Business and innovation-oriented consulting expertise</li> <li>■ Knowledge-transfer capabilities</li> <li>■ Manufacturing supply chain engagement structures</li> <li>■ Flexible office and workshop spaces incorporating emerging technologies (e.g. digital manufacturing lab) to support prototype and pilot-oriented fabrication</li> <li>■ Virtual and shared office services</li> </ul>	<p>High Priority</p> <p>Long term</p>	Support	UOIT, Durham Region, Province of Ontario, Durham College, DSEA, Oshawa Chamber of Commerce, Spark	<p>Number of local companies at missions/tradeshows attended</p> <p>Potential technology integration projects identified</p> <p>Number of local industry-academic research projects identified</p>
<p>3. Engage local companies through existing business survey initiatives to undertake a technology audit of the</p>	Medium priority	Lead	UOIT, Durham	Number of companies using



local business base, with the intent of identifying key opportunities for advanced technology integration	Short term		College, Oshawa Chamber of Commerce, OCE	ONE partner resources
4. Develop an inventory of industry-academic research being conducted at regional institutions and businesses, and market projects to potential partner firms/researchers (e.g. renewable energy, additive manufacturing)	Medium priority Short term	Lead	UOIT, Durham College	
5. Building on momentum of Ignite and Spark, bring together businesses and organizations from different sector councils to create technology-based interest groups that support cross-sectoral collaboration on technology applications and solutions	Medium priority Medium term	Support	Spark, Durham Region, existing local technology groups, Oshawa Chamber of Commerce	
6. Encourage participation of business community in export initiatives and missions carried out by government agencies and industry organizations	Medium priority Short term	Lead	Spark, Durham Region, MEDTE, CME	
7. Build an awareness of Oshawa's accomplishments in knowledge-based industries through a broad-based marketing and communications initiative including: <ul style="list-style-type: none"> <li>■ Development of key company profiles</li> <li>■ Participation in sector seminars/meetings</li> </ul>	High priority Short term	Lead	MEDTE, DFAIT, Industry interest groups	





<ul style="list-style-type: none"><li>▪ Attendance at trade shows and seminars showcasing technology with local companies (e.g. OCE Discovery)</li><li>▪ Deployment of marketing materials and community profiles via website, press releases, social media</li></ul>			e.g.: Life Sciences Ontario, MaRS, Spark	
<b>Potential Sources of Funding and Assistance:</b> <ul style="list-style-type: none"><li>▪ Applied Research and Commercialization Initiative (FedDev Ontario)</li><li>▪ High Performance Computing (OCE)</li><li>▪ Prosperity Initiative (FedDev Ontario)</li><li>▪ Ontario Research Fund (MRI)</li></ul>				



## Advanced Manufacturing Initiatives

Required Actions	Priority & Timeline	Role of Oshawa	Potential Partners	Performance Measures
1. Develop strategies to support the integration and development of key emerging technologies among the advanced manufacturing sector in areas such as digital manufacturing, advanced materials, robotics/automation, synthetic biology, or bio-manufacturing	High priority  Short term	Lead/support	UOIT, Durham College, Spark, MaRS, OCE, CME	Number of companies making emerging technology investments
2. Develop investment attraction strategies around resource based industries that leverage existing strengths in automotive, machinery, and metals 2.1. Consider trade show (e.g. Western Manufacturing Show, FABTECH, PDAC) participation with Canadian Manufacturers and Exporters (CME) and MEDTE	High priority  Short term	Lead	CME, MEDTE	Capital investments (\$) in new technology across manufacturing sector
3. Work with Durham Region on leveraging agricultural strengths into related bio-based opportunities in pharmaceuticals/nutraceuticals, biomaterials manufacturing 3.1. Engage with major employers (e.g. GM) and institutional support (e.g. LHEARN, UOIT) on agriculture and bio-based product initiatives	Medium priority  Short term	Lead	Durham Region, regional businesses, OMAF	Resource-based investment inquiries  Number of companies engaging in bio-based manufacturing
4. Support the efforts of local and regional workforce development and educational partners on youth engagement, including: <ul style="list-style-type: none"> <li>■ Generating awareness among youth of careers in manufacturing</li> <li>■ Partnering with school boards to host a symposium for careers in the manufacturing sector</li> </ul>	Medium priority  Long term	Support	Durham Region, Durham District School Board, Durham Catholic School Board,	Total post-secondary enrollment in



<ul style="list-style-type: none"> <li>▪ Developing career information modules covering all operational aspects of the manufacturing industry for schools</li> <li>▪ Developing connections to post-secondary co-op programs, to encourage student recruitment</li> </ul>			UOIT, Durham College	engineering and manufacturing programs  Number of industry- academic collaborations
5. Support the creation of a collaborative manufacturing network in Oshawa, that encourages innovation and emerging technology adoption (based on Waterloo MIN)	Medium priority  Short term	Lead	Durham Region Spark, Canadian Manufacturers and Exporters	
<p><b>Potential Sources of Funding and Assistance:</b></p> <ul style="list-style-type: none"> <li>▪ Colleges Ontario Network for Industry Innovation (CONII)</li> <li>▪ Export Development Canada</li> <li>▪ Innovation Demonstration Fund (MRI)</li> <li>▪ Invest Canada – Community Initiatives (DFAIT)</li> <li>▪ Market Readiness (OCE)</li> <li>▪ Collaborate-to-Commercialize (OCE)</li> <li>▪ OCE-CEMI-NSERC Mining Manufacturing Program (OCE)</li> <li>▪ Prosperity Initiative (FedDev Ontario)</li> <li>▪ Scientists and Engineers in Business (FedDev Ontario)</li> <li>▪ SD Tech Fund (SDTC)</li> <li>▪ Youth STEM (FedDev Ontario)</li> </ul>				



## Health and Biosciences Initiatives

Required Actions	Priority & Timeline	Role of Oshawa	Potential Partners	Performance Measures
<p>1. Incorporate Lakeridge Hospital and Lakeridge Health Education Research Network (LHEARN) strategic visions into health and bioscience sector strategy, to create a sector hub that:</p> <ul style="list-style-type: none"> <li>▪ Leverages private sector partnerships to support business development</li> <li>▪ Provides a focal point for health sector innovation</li> <li>▪ Fosters industry-academic relationships and joint research projects in pharmaceuticals, medical devices, and primary care delivery</li> <li>▪ Strengthens the City's corporate base</li> </ul>	<p>High priority</p> <p>Medium term</p>	Support	<p>Lakeridge Hospital</p> <p>Lakeridge Health Education Research Network (LHERN), UOIT, Durham College, Spark, MaRS</p>	<p>Number of spin-off health informatics companies</p> <p>Number of spin-off medical device companies</p> <p>Number of health-manufacturing collaborative products</p>
<p>2. Develop a health and bioinformatics initiative to attract and develop companies in the field, building on:</p> <ul style="list-style-type: none"> <li>▪ Health informatics capabilities and programming at UOIT and Durham College</li> <li>▪ UOIT corporate partnerships (e.g. IBM)</li> <li>▪ Health IT applications/provisions at Lakeridge Health</li> </ul>	<p>Medium priority</p> <p>Short to Medium term</p>	Lead	<p>Lakeridge Hospital</p> <p>Lakeridge Health Education Research Network (LHERN), UOIT, Durham College, Spark, MaRS, MEDTE</p>	<p>Number of industry-academic collaborations</p> <p>Total post-secondary enrollment in biomedical engineering programs</p>
<p>3. Leverage existing manufacturing, design, and development capabilities in local businesses to build out the medical</p>	Medium priority	Lead	Potential Collaborators:	



<p>device and equipment subsector</p> <p>3.1. Leverage bio-medical engineering programming provision at Durham College for start-ups, sector development, and talent attraction/retention</p> <p>3.2. Support the development of education and research capacity within college or UOIT focused on medical devices sector</p> <p>3.3. Coordinate medical device manufacturing marketing activities with advanced manufacturing sector activities</p>	<p>Medium term</p>		<p>Durham College, UOIT, Health Technology Exchange, Spark, MaRS</p>	<p>Number of health and biosciences related inquiries</p>
<p>4. Work with key industry associations to develop a marketing and communications strategy to build awareness of Oshawa’s assets, accomplishments, and capabilities in health and biosciences, particularly in community health and wellness, pharmaceutical trials, informatics, and research and education</p>	<p>High priority</p> <p>Medium term</p>	<p>Lead</p>	<p>Life Sciences Ontario, BioteCanada MaRS, Lakeridge Health, GTMA</p>	
<p><b>Potential Sources of Funding and Assistance:</b></p> <ul style="list-style-type: none"> <li>■ Applied Research and Commercialization Initiative (FedDev Ontario)</li> <li>■ Market Readiness (OCE)</li> <li>■ Collaborate-to-Commercialize (OCE)</li> <li>■ Connections (OCE)</li> <li>■ Experiential Learning Program (OCE)</li> <li>■ Graduate Enterprise Internship (FedDev Ontario)</li> <li>■ Prosperity Initiative (FedDev Ontario)</li> <li>■ High Performance Computing (OCE)</li> <li>■ Invest Canada – Community Initiatives (DFAIT)</li> <li>■ Medical Sciences Proof-of-Principle (OCE)</li> <li>■ Ontario Research Fund (MRI)</li> <li>■ Scientists and Engineers in Business (FedDev Ontario)</li> <li>■ SD Tech Fund (SDTC)</li> </ul>				



## Energy Generation Initiatives

Required Actions	Priority & Timeline	Role of Oshawa	Potential Partners	Performance Measures
1. Building on the efforts to develop the Advanced Manufacturing Research Centre at UOIT, develop a strategy and business plan for nuclear and energy-related manufacturing and construction activities at the centre, including consideration of supply chain development, training, R&D, and business support needed	High priority  Long term	Support	UOIT, Durham College, DSEA, OCI, and Oshawa Chamber of Commerce, OPG	Institutional buy-in for advanced manufacturing nuclear focus  Number of new companies in emerging energy technologies
2. Leverage commercialization channels of Energy Research Centre (ERC) at UOIT and existing supply chains of OPG to identify emerging energy technologies to integrate into investment attraction and small business support programming	Medium priority  Short to Medium term	Lead	UOIT, Durham College, DSEA	Number of local companies in energy generation supply chain
3. Work with existing corporate base (e.g. Enbridge, OPG, H2O Power) and supply chain development efforts (e.g. Organization of Canadian Nuclear Industries) to identify supply chain gaps and strategies to support investment attraction, including opportunities around nuclear refurbishment and natural gas construction/maintenance	High priority  Short to medium term	Lead	DSEA, Enbridge, OPG, H2O Power, OCI, CME	Number of local contracts awarded in energy generation sector (maintenance, construction, management, manufacturing)
4. Build on fledgling local sustainable energy sector through business expansion and investment attraction activities 4.1. Work with organizations like Clean Tech North, Ontario Sustainable Energy Association to develop awareness of Oshawa, and foster relationships in sector 4.2. Work with SPARK and ERC to support new start-ups	Medium priority  Short to medium term	Lead	DSEA, Clean Tech North, Ontario Sustainable Energy	Number of renewable



and grow businesses in emerging technology areas			Association, MEDTE	energy technology companies
<b>Potential Sources of Funding and Assistance:</b> <ul style="list-style-type: none"><li>■ Applied Research and Commercialization Initiative (FedDev Ontario)</li><li>■ Business Technology Development Program (FedDev Ontario)</li><li>■ Market Readiness (OCE)</li><li>■ Collaborate-to-Commercialize (OCE)</li><li>■ Investing in Business Innovation (FedDev Ontario)</li><li>■ Ontario Research Fund (MRI)</li><li>■ Scientists and Engineers in Business (FedDev Ontario)</li><li>■ SD Tech Fund (SDTC)</li></ul>				



## Multimodal Transportation and Logistics Initiatives

Required Actions	Priority & Timeline	Role of Oshawa	Potential Partners	Performance Measures
<p>1. Engage with stakeholders in the GTA, GGH, and Eastern Ontario to create a vision for a multimodal infrastructure hub, including an outline of required transportation and logistics infrastructure</p> <p>1.1. Engage with local business community to establish potential demand around existing assets (e.g. port, airport) and potential assets (e.g. FTZ-like policy areas)</p> <p>1.2. Investigate the potential for development of a freight village/intermodal hub in Oshawa</p>	<p>Medium priority</p> <p>Long term</p>	Support	<p>Port of Oshawa, Oshawa Airport, CN, CP, Durham Region Eastern Ontario Warden's Caucus</p> <p>Private sector logistics companies, Ontario East Economic Development</p>	<p>Number of IT-enabled supply chain logistics companies</p> <p>Number of logistics and distribution centres</p> <p>Enrollment in logistics and supply chain management programs</p>
<p>2. Engage with local institutional and private sector assets to develop a technology-enabled logistics investment attraction and business support strategy for Oshawa</p>	<p>Medium priority</p> <p>Short to medium term</p>	Lead	<p>Minacs, Canada Cartage, UOIT, Durham College</p>	<p>Number of research projects focused on logistics being undertaken</p>
<p>3. Leverage region's expected population growth to capitalize on retailer's interests in distribution centres, and investigate participation at Retail Leaders Industry Association Conference (to target US companies)</p>	<p>High priority</p> <p>Short term</p>	Lead	<p>Local transportation and logistics companies</p>	<p>Number of co-op, experiential learning, or internship positions</p>





<p>4. Engage post-secondary institutions to investigate development of more specialist logistics education programming at the diploma/Certificate level (Durham College) and undergraduate degree level (UOIT) that leverages current inter-disciplinary program strengths</p> <p>4.1. Engage post-secondary faculty to assess opportunities to build supply chain logistics research capacity</p> <p>4.2. Engage with local business community to support development of internship, co-op, and experiential learning opportunities focused on increasing the productivity and efficiency of transportation and logistics firms</p>	<p>Medium priority</p> <p>Short to medium term</p>	<p>Lead/Support</p>	<p>UOIT, Durham College, OCE</p>	<p>available</p> <p>Number of local co-op, experiential learning, or internship students placed</p>
<p>5. Engage with supply chain logistics groups to develop awareness of Oshawa as a potential logistics hub</p>	<p>High priority</p> <p>Short term</p>	<p>Lead</p>	<p>HWYH20 SCL-Canada, Supply Chain Logistics Council Canada, IWLA</p>	
<p><b>Potential Sources of Funding and Assistance:</b></p> <ul style="list-style-type: none"> <li>■ Experiential Learning Program (OCE)</li> <li>■ High Performance Computing (OCE)</li> <li>■ Invest Canada – Community Initiatives (DFAIT)</li> </ul>				



## Information Technology Initiatives

Required Actions	Priority & Timeline	Role of Oshawa	Potential Partners	Performance Measures
1. Identify and promote grassroots activities in IT growth areas across Durham Region to Oshawa-based companies, entrepreneurs, and students	Medium priority Short term	Support	Spark, ONE, Durham Region, MaRS, UOIT, Durham College	Number of knowledge-based businesses
2. Support downtown revitalization efforts with the intent of supporting place-making initiatives meant to attract and retain knowledge-based workers	High priority Medium term	Lead	City of Oshawa	Number of IT-related business expansion projects
3. Build partnerships with innovative local companies to identify and attract potential collaborative industry or academic partners, and investors	Medium priority Medium term	Lead	Leading local innovators (e.g. Cimetrix, Minacs)	Number of IT companies focused on other sectors
4. Ensure advanced manufacturing strategic programming integrates the use of IT as a means of increasing productivity and competitiveness, or attracting new and high-value companies	High priority Short term	Lead		Number of inquiries related to IT/Big data
5. Target information security and big data companies focused on servicing advanced manufacturing, health and biosciences, energy, and logistics companies	Medium priority	Lead	MEDTE, DFAIT,	



	Short term		GTMA	
<b>Potential Sources of Funding and Assistance:</b>				
<ul style="list-style-type: none"><li>▪ Business Technology Development Program (FedDev Ontario)</li><li>▪ Market Readiness (OCE)</li><li>▪ Collaborate-to-Commercialize (OCE)</li><li>▪ High Performance Computing (OCE)</li><li>▪ Invest Canada – Community Initiatives (DFAIT)</li><li>▪ Prosperity Initiative (FedDev Ontario)</li></ul>				

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# Appendices

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## Appendix I: Target Sector NAICS Definitions

Advanced Manufacturing			
2 Digit	3 Digit	4 Digit	6 Digit
31-33 - Manufacturing	323 - Printing and related support activities	3231 - Printing and Related Support Activities	323113 - Commercial screen printing
			323114 - Quick printing
			323115 - Digital printing
			323116 - Manifold business forms printing
			323119 - Other printing
			323120 - Support activities for printing
	325 - Chemical manufacturing	3251 - Basic Chemical Manufacturing	325110 - Petrochemical manufacturing
			325120 - Industrial gas manufacturing
			325130 - Synthetic dye and pigment manufacturing
			325181 - Alkali and chlorine manufacturing
			325189 - All other basic inorganic chemical manufacturing
			325190 - Other basic organic chemical manufacturing
			325210 - Resin and synthetic rubber manufacturing
			325220 - Artificial and
	3252 - Resin, Synthetic Rubber, and Artificial and Synthetic Fibres and Filaments Manufacturing		



			synthetic fibres and filaments manufacturing
		3253 - Pesticide, Fertilizer and Other Agricultural Chemical Manufacturing	325313 - Chemical fertilizer (except potash) manufacturing
			325314 - Mixed fertilizer manufacturing
			325320 - Pesticide and other agricultural chemical manufacturing
		3254 - Pharmaceutical and Medicine Manufacturing	325410 - Pharmaceutical and medicine manufacturing
		3255 - Paint, Coating and Adhesive Manufacturing	325510 - Paint and coating manufacturing
			325520 - Adhesive manufacturing
		3256 - Soap, Cleaning Compound and Toilet Preparation Manufacturing	325610 - Soap and cleaning compound manufacturing
			325620 - Toilet preparation manufacturing
		3259 - Other Chemical Product Manufacturing	325910 - Printing ink manufacturing
			325920 - Explosives manufacturing
			325991 - Custom compounding of purchased resins
			325999 - All other miscellaneous chemical product manufacturing
	326 - Plastics and rubber	3261 - Plastic Product Manufacturing	326111 - Plastic bag and pouch manufacturing



	products manufacturing		326114 - Plastic film and sheet manufacturing
			326121 - Unlaminated plastic profile shape manufacturing
			326122 - Plastic pipe and pipe fitting manufacturing
			326130 - Laminated plastic plate, sheet (except packaging), and shape manufacturing
			326140 - Polystyrene foam product manufacturing
			326150 - Urethane and other foam product (except polystyrene) manufacturing
			326160 - Plastic bottle manufacturing
			326191 - Plastic plumbing fixture manufacturing
			326193 - Motor vehicle plastic parts manufacturing
			326196 - Plastic window and door manufacturing
			326198 - All other plastic product manufacturing
			326210 - Tire manufacturing
			326220 - Rubber and plastic hose and belting manufacturing
			326290 - Other rubber product manufacturing
		3262 - Rubber Product Manufacturing	



	331 - Primary metal manufacturing	3311 - Iron and Steel Mills and Ferro-Alloy Manufacturing	331110 - Iron and steel mills and ferro-alloy manufacturing
		3312 - Steel Product Manufacturing from Purchased Steel	331210 - Iron and steel pipes and tubes manufacturing from purchased steel
			331221 - Cold-rolled steel shape manufacturing
			331222 - Steel wire drawing
		3313 - Alumina and Aluminum Production and Processing	331313 - Primary production of alumina and aluminum
			331317 - Aluminum rolling, drawing, extruding and alloying
		3314 - Non-Ferrous Metal (except Aluminum) Production and Processing	331410 - Non-ferrous metal (except aluminum) smelting and refining
			331420 - Copper rolling, drawing, extruding and alloying
			331490 - Non-ferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying
		332 - Fabricated metal product manufacturing	3321 - Forging and Stamping
	332118 - Stamping		
	3322 - Cutlery and Hand Tool Manufacturing		332210 - Cutlery and hand tool manufacturing
3323 - Architectural and Structural Metals Manufacturing	332311 - Prefabricated metal building and		





		component manufacturing
		332314 - Concrete reinforcing bar manufacturing
		332319 - Other plate work and fabricated structural product manufacturing
		332321 - Metal window and door manufacturing
		332329 - Other ornamental and architectural metal product manufacturing
	3324 - Boiler, Tank and Shipping Container Manufacturing	332410 - Power boiler and heat exchanger manufacturing
		332420 - Metal tank (heavy gauge) manufacturing
		332431 - Metal can manufacturing
		332439 - Other metal container manufacturing
	3325 - Hardware Manufacturing	332510 - Hardware manufacturing
	3326 - Spring and Wire Product Manufacturing	332611 - Spring (heavy gauge) manufacturing
		332619 - Other fabricated wire product manufacturing
	3327 - Machine Shops, Turned Product, and Screw, Nut and Bolt Manufacturing	332710 - Machine shops
		332720 - Turned product and screw, nut and bolt manufacturing
	3328 - Coating, Engraving, Heat	332810 - Coating,



		Treating and Allied Activities	engraving, cold and heat treating and allied activities
		3329 - Other Fabricated Metal Product Manufacturing	332910 - Metal valve manufacturing
			332991 - Ball and roller bearing manufacturing
	332999 - All other miscellaneous fabricated metal product manufacturing		
	333 - Machinery manufacturing	3331 - Agricultural, Construction and Mining Machinery Manufacturing	333110 - Agricultural implement manufacturing
			333120 - Construction machinery manufacturing
			333130 - Mining and oil and gas field machinery manufacturing
		3332 - Industrial Machinery Manufacturing	333245 - Sawmill and woodworking machinery manufacturing
			333246 - Rubber and plastics industry machinery manufacturing
			333247 - Paper industry machinery manufacturing
			333248 - All other industrial machinery manufacturing
		3333 - Commercial and Service Industry Machinery Manufacturing	333310 - Commercial and service industry machinery manufacturing
		3334 - Ventilation, Heating, Air-Conditioning and Commercial	333413 - Industrial and commercial fan and blower



		Refrigeration Equipment Manufacturing	and air purification equipment manufacturing
			333416 - Heating equipment and commercial refrigeration equipment manufacturing
		3335 - Metalworking Machinery Manufacturing	333511 - Industrial mould manufacturing
			333519 - Other metalworking machinery manufacturing
		3336 - Engine, Turbine and Power Transmission Equipment Manufacturing	333611 - Turbine and turbine generator set unit manufacturing
			333619 - Other engine and power transmission equipment manufacturing
		3339 - Other General-Purpose Machinery Manufacturing	333910 - Pump and compressor manufacturing
			333920 - Material handling equipment manufacturing
			333990 - All other general-purpose machinery manufacturing
		334 - Computer and electronic product manufacturing	3341 - Computer and Peripheral Equipment Manufacturing
3342 - Communications Equipment Manufacturing	334210 - Telephone apparatus manufacturing		
		334220 - Radio and television broadcasting and wireless communications	



		equipment manufacturing
		334290 - Other communications equipment manufacturing
	3343 - Audio and Video Equipment Manufacturing	334310 - Audio and video equipment manufacturing
	3344 - Semiconductor and Other Electronic Component Manufacturing	334410 - Semiconductor and other electronic component manufacturing
	3345 - Navigational, Measuring, Medical and Control Instruments Manufacturing	334511 - Navigational and guidance instruments manufacturing
		334512 - Measuring, medical and controlling devices manufacturing
	3346 - Manufacturing and Reproducing Magnetic and Optical Media	334610 - Manufacturing and reproducing magnetic and optical media
335 - Electrical equipment, appliance and component manufacturing	3351 - Electric Lighting Equipment Manufacturing	335110 - Electric lamp bulb and parts manufacturing
		335120 - Lighting fixture manufacturing
	3352 - Household Appliance Manufacturing	335210 - Small electrical appliance manufacturing
		335223 - Major kitchen appliance manufacturing
		335229 - Other major appliance manufacturing
	3353 - Electrical Equipment Manufacturing	335311 - Power, distribution and specialty transformers manufacturing
		335312 - Motor and



		3359 - Other Electrical Equipment and Component Manufacturing	generator manufacturing
			335315 - Switchgear and switchboard, and relay and industrial control apparatus manufacturing
			335910 - Battery manufacturing
			335920 - Communication and energy wire and cable manufacturing
			335930 - Wiring device manufacturing
	336 - Transportation equipment manufacturing	3361 - Motor Vehicle Manufacturing	336110 - Automobile and light-duty motor vehicle manufacturing
			336120 - Heavy-duty truck manufacturing
		3362 - Motor Vehicle Body and Trailer Manufacturing	336211 - Motor vehicle body manufacturing
			336212 - Truck trailer manufacturing
			336215 - Motor home, travel trailer and camper manufacturing
		3363 - Motor Vehicle Parts Manufacturing	336310 - Motor vehicle gasoline engine and engine parts manufacturing
			336320 - Motor vehicle electrical and electronic



			equipment manufacturing
			336330 - Motor vehicle steering and suspension components (except spring) manufacturing
			336340 - Motor vehicle brake system manufacturing
			336350 - Motor vehicle transmission and power train parts manufacturing
			336360 - Motor vehicle seating and interior trim manufacturing
			336370 - Motor vehicle metal stamping
			336390 - Other motor vehicle parts manufacturing
		3364 - Aerospace Product and Parts Manufacturing	336410 - Aerospace product and parts manufacturing
		3365 - Railroad Rolling Stock Manufacturing	336510 - Railroad rolling stock manufacturing
		3366 - Ship and Boat Building	336611 - Ship building and repairing
			336612 - Boat building
		3369 - Other Transportation Equipment Manufacturing	336990 - Other transportation equipment manufacturing
	339 - Miscellaneous manufacturing	3391 - Medical Equipment and Supplies Manufacturing	339110 - Medical equipment and supplies manufacturing
53 - Real	532 - Rental	5324 - Commercial and	532490 - Other Commercial



Estate and Rental and Leasing	and Leasing Services	Industrial Machinery and Equipment Rental and Leasing	and Industrial Machinery and Equipment Rental and leasing
54 - Professional, Scientific, and Technical Services	541 - Professional, Scientific, and Technical Services	5414 - Specialized Design Services	541420 - Industrial Design Services
		5416 - Management, Scientific, and Technical Consulting Services	541611 - Administrative Management and General Management Consulting Services
			541619 - Other Management Consulting Services
			541690 - Other Scientific and Technical Services Consulting
5417 - Scientific Research and Development Services	541710 - Research and Development in the Physical, Engineering, and Life Sciences		
81 - Other Services (except Public Administration)	811 - Repair and Maintenance	8112 - Electronic and Precision Equipment Repair	811210 - Electronic and Precision Equipment Repair
		8113 - Commercial and Industrial Machinery and Equipment (except Automotive) Repair and Maintenance	811310 - Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance



Health and Biosciences			
2 Digit	3 Digit	4 Digit	6 Digit
11 - Agriculture, Forestry, Fishing, and Hunting	111 - Crop production	1111 - Oilseed and grain farming	111110 - Soybean Farming
			111120 - Oilseed (Except Soybean) Farming
			111130 - Dry Pea and Bean Farming
			111140 - Wheat Farming
			111150 - Corn Farming
			111160 - Rice Farming
			111190 - Other Grain Farming
		1112 - Vegetable and melon farming	111219 - Other Vegetable (except Potato) and Melon Farming
		1113 - Fruit and tree nut farming	111310 - Orange Groves
			111320 - Citrus (Except Orange) Groves
	111330 - Non-Citrus Fruit and Tree Nut Farming		
	1114 - Greenhouse, nursery and floriculture production	111419 - Other Food Crops Grown Under Cover	
	1119 - Other crop farming	111993 - Fruit and Vegetable Combination Farming	
		111994 - Maple Syrup and Products Production	
		111999 - Other Miscellaneous Crop Farming	
112 - Animal production and	1121 - Cattle ranching and farming	112110 - Beef cattle Ranching and Farming,	





	aquaculture		Including Feedlots
			112120 - Dairy Cattle and Milk Production
		1122 - Hog and pig farming	112210 - Hog and Pig Farming
		1123 - Poultry and egg production	112310 - Chicken Egg Production
			112320 - Broiler and Other Meat-Type Chicken Production
			112330 - Turkey Production
			112391 - Combination Poultry and Egg Production
			112399 - All Other Poultry Production
		1124 - Sheep and goat farming	112410 - Sheep Farming
			112420 - Goat Farming
		1125 - Aquaculture	112510 - Aquaculture
		1129 - Other animal production	112910 - Apiculture
			112991 - Animal Combination Farming
			112999 - All Other Miscellaneous Animal Production
31-33 - Manufacturing	311 - Food manufacturing	3112 - Grain and Oilseed Milling	311211 - Flour Milling
			311211 - Wet Corn Milling
			311214 - Rice Milling and Malt Manufacturing
			311224 - Oilseed Processing
			311225 - Fat and Oil Refining and Blending



			311230 - Breakfast Cereal Manufacturing
		3113 - Sugar and Confectionery Product Manufacturing	311310 - Sugar Manufacturing
			311320 - Chocolate Confectionary Manufacturing from Cacao Beans
			311330 - Confectionary Manufacturing from Purchased Chocolate
			311340 - Non-chocolate Confectionary Manufacturing
		3114 - Fruit and Vegetable Preserving and Specialty Food Manufacturing	311410 - Frozen Food Manufacturing
			311420 - Fruit and Vegetable Canning, Pickling and Drying
		3115 - Dairy Product Manufacturing	311511 - Fluid Milk Manufacturing
			311515 - Butter, Cheese, and Dry and Condensed Dairy Product Manufacturing
			311520 - Ice Cream and Frozen Dessert Manufacturing
		3116 - Meat Product Manufacturing	311611 - Animal (Except Poultry) Slaughtering
			311615 - Poultry Processing



	3117 - Seafood Product Preparation and Packaging	311710 - Seafood Product Preparation and Packaging
	3118 - Bakeries and Tortilla Manufacturing	311811 - Retail Bakeries
		311814 - Commercial Bakeries and Frozen Bakery Product Manufacturing
		311821 - Cookie and Cracker Manufacturing
		311822 - Flour Mixes and Dough Manufacturing from Purchased Flour
		311823 - Dry Pasta Manufacturing
		311830 - Tortilla Manufacturing
	3119 - Other Food Manufacturing	311911 - Roasted Nut and Peanut Butter Manufacturing
		311919 - Other Snack Food Manufacturing
		311920 - Coffee and Tea Manufacturing
		311930 - Flavouring Syrup and Concentrate Manufacturing
		311990 - All Other Food Manufacturing
312 - Beverage and tobacco product manufacturing	3121 - Beverage Manufacturing	312110 - Soft Drink and Ice Manufacturing
325 - Chemical	3251 - Basic Chemical	325120 - Industrial Gas



	manufacturing	Manufacturing	Manufacturing
			325181 - Alkali and Chlorine Manufacturing
			325189 - All Other Basic Inorganic Chemical Manufacturing
			325190 - Other Basic Organic Chemical Manufacturing
		3254 - Pharmaceutical and Medicine Manufacturing	325410 - Pharmaceutical and Medicine Manufacturing
		3259 - Other Chemical Product Manufacturing	325999 - All Other Miscellaneous Chemical Product Manufacturing
	334 - Computer and electronic product manufacturing	3345 - Navigational, Measuring, Medical and Control Instruments Manufacturing	334512 - Measuring, Medical and Controlling Devices Manufacturing
	339 - Miscellaneous manufacturing	3391 - Medical Equipment and Supplies Manufacturing	339110 - Medical Equipment and Supplies Manufacturing
41 - Wholesale Trade	414 - Personal and household goods merchant wholesalers	4145 - Pharmaceuticals, toiletries, cosmetics and sundries merchant wholesalers	414510 - Pharmaceuticals and Pharmacy Supplies Wholesaler-Distributors
			414520 - Toiletries, Cosmetics and Sundries Wholesaler-Distributors
54 - Professional, Scientific, and Technical	541 - Professional, scientific, and technical services	5417 - Scientific research and development services	541710 - Research and Development in the Physical, Engineering and Life Sciences



Services		5419 - Other professional, scientific, and technical services	541990 - All Other Professional, Scientific and Technical Services
62 - Health Care and Social Assistance	621 - Ambulatory health care services	6211 - Offices of physicians	621110 - Offices of Physicians
		6212 - Offices of dentists	621210 - Offices of Dentists
		6213 - Offices of other health practitioners	621310 - Offices of Chiropractors
			621320 - Offices of Optometrists
			621330 - Offices of Mental Health Practitioners (except Physicians)
			621340 - Offices of Physical, Occupational, and Speech Therapists and Audiologists
			621390 - Offices of All Other Health Practitioners
			6214 - Out-patient care centres
		621420 - Out-Patient Mental Health and Substance Abuse Centres	
		621494 - Community Health Centres	
		621499 - All Other Out-Patient Care Centres	
		6215 - Medical and diagnostic laboratories	621510 - Medical and Diagnostic Laboratories
		6216 - Home health care services	621610 - Home Health Care Services



		621911 - Ambulance (except Air Ambulance) Services
	6219 - Other ambulatory health care services	621912 - Air Ambulance Services
		621990 - All Other Ambulatory Health Care Services
622 - Hospitals	6221 - General medical and surgical hospitals	622111 - General (except Paediatric) Hospitals
		622112 - Paediatric Hospitals
	6222 - Psychiatric and substance abuse hospitals	622210 - Psychiatric and Substance Abuse Hospitals
	6223 - Specialty (except psychiatric and substance abuse) hospitals	622310 - Specialty (except Psychiatric and Substance Abuse) Hospitals
623 - Nursing and residential care facilities	6231 - Nursing care facilities	623110 - Nursing Care Facilities
	6232 - Residential developmental handicap, mental health and substance abuse facilities	623210 - Residential Developmental Handicap Facilities
		623221 - Residential Substance Abuse Facilities
		623222 - Homes for the Psychiatrically Disabled
	6233 - Community care facilities for the elderly	623310 - Community Care Facilities for the Elderly
	6239 - Other residential care facilities	623991 - Transition Homes for Women
623992 - Homes for Emotionally Disturbed		



		Children
		623993 - Homes for the Physically Handicapped or Disabled
		623999 - All Other Residential Care Facilities
624 - Social assistance	6241 - Individual and family services	624120 - Services for the Elderly and Persons with Disabilities
		624190 - Other Individual and Family Services
	6242 - Community food and housing, and emergency and other relief services	624210 - Community Food Services
		624220 - Community Housing Services
		624230 - Emergency and Other Relief Services
	6243 - Vocational rehabilitation services	624310 - Vocational Rehabilitation Services
6244 - Child day-care services	624410 - Child Day-Care Services	



Energy Generation			
2 Digit	3 Digit	4 Digit	6 Digit
22 - Utilities	221 - Utilities	2211 - Electric power generation, transmission, and distribution	221111 - Hydro-electric power generation
			221112 - Fossil-fuel electric power generation
			221113 - Nuclear electric power generation
			221119 - Other electric power generation
			221121 - Electric bulk power transmission and control
			221122 - Electric power distribution
23 - Construction	237 - Heavy and civil engineering construction	2371 - Utility system construction	237130 - Power and communication line and related structures construction
		2379 - Other heavy and civil engineering construction	237990 - Other heavy and civil engineering construction
	238 - Specialty trade contractors	2382 - Building equipment contractors	238210 - Electrical contractors and other wiring installation contractors
31-33 - Manufacturing	325 - Chemical manufacturing	3251 - Basic chemical manufacturing	325190 - Other basic organic chemical manufacturing
	333 - Machinery Manufacturing	3336 - Engine, Turbine and Power Transmission Equipment Manufacturing	333611 - Turbine and turbine generator set unit manufacturing
			333619 - Other engine and power transmission equipment manufacturing
335 - Electrical Equipment, Appliance and	3353 - Electrical Equipment Manufacturing	335311 - Power, Distribution and Specialty Transformers	





	Component Manufacturing		Manufacturing
			335312 - Motor and Generator Manufacturing
			335315 - Switchgear and Switchboard, and Relay and Industrial Control Apparatus Manufacturing
		3359 - Other Electrical Equipment and Component Manufacturing	335910 - Battery manufacturing
			335920 - Communication and energy wire and cable manufacturing
			335990 - All Other Electrical Equipment and Component Manufacturing
54 - Professional, scientific, and technical services	541 - Professional, scientific, and technical services	5413 - Architectural, Engineering and Related Services	541330 - Engineering services
			541340 - Drafting services
		5416 - Management, scientific, and technical consulting services	541620 - Environmental consulting services
			541690 - Other scientific and technical consulting services
5417 - Scientific research and development services	541710 - Research and development in the physical, engineering, and life sciences		
81 - Other services (except public administration)	811 - Repair and maintenance	8112 - Electronic and Precision Equipment Repair and Maintenance	811210 - Electronic and Precision Equipment Repair and Maintenance



Multimodal Transportation and Logistics					
2 Digit	3 Digit	4 Digit	6 Digit		
48-49 - Transportation and Warehousing	481 - Air transportation	4811 - Scheduled air transportation	481110 - Scheduled air transportation		
		4812 - Non-scheduled air transportation	481214 - Non-scheduled chartered air transportation 481215 - Non-scheduled specialty flying services		
	482 - Rail transportation	4821 - Rail transportation	482112 - Short-haul freight rail transportation		
			482113 - Mainline freight rail transportation		
			482114 - Passenger rail transportation		
	483 - Water transportation	4831 - Deep sea, coastal and great lakes water transportation	483115 - Deep sea, coastal and Great Lakes water transportation (except by ferries)		
			483116 - Deep sea, coastal and Great Lakes water transportation by ferries		
		4832 - Inland water transportation	483213 - Inland water transportation (except by ferries)		
			483214 - Inland water transportation by ferries		
	484 - Truck transportation	4841 - General freight trucking	484110 - General freight trucking, local		
			484121 - General freight trucking, long distance, truck-load		
			484122 - General freight trucking, long distance, less than truck-load		
		4842 - Specialized freight trucking	484210 - Used household and office goods moving		
			484221 - Bulk liquids trucking, local		
			484222 - Dry bulk materials trucking, local		
			484223 - Forest products trucking, local		



		484229 - Other specialized freight (except used goods) trucking, local
		484231 - Bulk liquids trucking, long distance
		484232 - Dry bulk materials trucking, long distance
		484233 - Forest products trucking, long distance
		484239 - Other specialized freight (except used goods) trucking, long distance
488 - Support activities for transportation	4881 - Support activities for air transportation	488111 - Air traffic control
		488119 - Other airport operations
		488190 - Other support activities for air transportation
	4882 - Support activities for rail transportation	488210 - Support activities for rail transportation
	4883 - Support activities for water transportation	488310 - Port and harbour operations
		488320 - Marine cargo handling
		488331 - Marine salvage services
		488332 - Ship piloting services
		488339 - Other navigational services to shipping
	488390 - Other support activities for water transportation	
	4884 - Support activities for road transportation	488410 - Motor vehicle towing
		488490 - Other support activities for road transportation
	4885 - Freight transportation arrangement	488511 - Marine shipping agencies
		488519 - Other freight transportation arrangement
4889 - Other support activities for transportation	488990 - Other support activities for transportation	



	491 - Postal service	4911 - Postal service	491110 - Postal service
	492 - Couriers and messengers	4921 - Couriers	492110 - Couriers
		4922 - Local messengers and local delivery	492210 - Local messengers and local delivery
	493 - Warehousing and storage	4931 - Warehousing and storage	493110 - General warehousing and storage
			493120 - Refrigerated warehousing and storage
			493130 - Farm product warehousing and storage
			493190 - Other warehousing and storage



Information Technology			
2 Digit	3 Digit	4 Digit	6 Digit
51 - Information and Cultural Industries	511 - Publishing Industries	5112 - Software Publishers	*511210 - Software Publishers (except video game publishers)
54 - Professional, Scientific, and Technical Services	541 - Professional, Scientific, and Technical Services	5415- Computer Systems Design and Related Services	541510 - Computer Systems Design and Related Services
		5416 - Management, Scientific, and Technical Consulting Services	541611 - Administrative Management and General management Consulting Services
			541612 - Human Resources Consulting Services
56 - Administrative and Support, Waste Management and Remediation Services	561 - Administrative and Support Services	5614 - Business Support Services	561420 - Telephone Call Centres
			561430 - Business Service Centres

\* 511211 - Software Publishers (except video game publishers) in NAICS 2012



## Appendix II: Target Sector Audit Profiles

### Advanced Manufacturing

Advanced Manufacturing	
<b>What are the key trends in this sector</b>	<p><b>Operational Trends:</b></p> <ul style="list-style-type: none"><li>▪ Ubiquitous role of information technology</li><li>▪ Reliance on modelling and simulation in manufacturing processes</li><li>▪ Acceleration of innovation in supply-chain management</li><li>▪ Agile manufacturing systems that respond rapidly to customer needs and external impediments</li><li>▪ Acceptance and support of sustainable manufacturing</li><li>▪ Organizational and business-model focus on process improvement</li><li>▪ Global demand potential for capital projects and natural resources (BRICs)</li></ul> <p><b>Key Sub-Sector Trends:</b> Major advances in two mature areas:</p> <ul style="list-style-type: none"><li>▪ Semiconductor fabrication</li><li>▪ Advanced materials with a focus on integrated computational materials engineering (ICME): an emerging discipline that can accelerate materials development and unify design and manufacturing</li></ul> <p><b>Emerging Technologies:</b></p> <ul style="list-style-type: none"><li>▪ Additive and digital manufacturing: (aka 3D printing) has potential to change how future products are designed, sold, and delivered to customers, through mass customization and easy design. Potential to replace significant portions of traditional industrial manufacturing.</li><li>▪ Synthetic biology, bio-manufacturing has the potential to manufacture biological substances from radically engineered biological systems for novel purposes. Could reframe common conceptions of advanced manufacturing.</li><li>▪ In 20 years, manufacturing is expected to advance to new frontiers, resulting in an increasingly automated and data-intensive manufacturing sector that will likely replace traditional manufacturing.</li></ul>



Advanced Manufacturing	
	<ul style="list-style-type: none"> <li>■ Manufacturing is entering a transformative period, with a renewed focus on product and process innovation, and unprecedented collaboration across the value chain.</li> </ul>
<b>Sub-Sector Assessment</b>	<ul style="list-style-type: none"> <li>■ Company base made up of large and small employers, with limited presence at medium-size ranges</li> <li>■ <b>A diversified manufacturing base</b> serving multiple sectors:               <ul style="list-style-type: none"> <li>● Activity in growth and high value manufacturing areas – aerospace, mining, nuclear, energy</li> <li>● Strengths in heavy manufacturing, structural metals, machinery</li> <li>● Agility among companies that have diversified into new sectors</li> <li>● Synergies with other target sectors: energy, logistics, ICT, health</li> <li>● Strong transportation sector that extends beyond auto: rail, specialist trucks/trailers etc.</li> <li>● Global leaders companies in their field e.g. G.M., EHC Global</li> </ul> </li> <li>■ <b>Companies with a global reach:</b> GeoSight, P.R. Engineering, Enable Interconnect among others</li> <li>■ Companies are integrating ICT into their business processes</li> <li>■ <b>Cutting edge technology deployment:</b> Cimatrix provides additive manufacturing solutions; Minacs is involved in product development technologies for GM through ONSTAR</li> <li>■ Local support networks through SPARK, UOIT, Durham College</li> <li>■ <b>Support companies offer business process improvement services e.g.</b> Minacs, The PIC Group, Syncreon</li> <li>■ Little or no evidence of bio-manufacturing activity or semi-conductor manufacturing</li> <li>■ Far reaching global supply chains among some subsectors (e.g. automotive)</li> <li>■ High company satisfaction with manufacturing support in Oshawa</li> <li>■ Extensive R&amp;D capabilities in key areas such as advanced materials, nanotechnology, robotics, and automation providing support to local company base</li> <li>■ Specialist educational programs at all levels covering the manufacturing process</li> <li>■ Skills availability issues for some companies</li> <li>■ Organization of Canadian Nuclear Industries is putting forward an advanced manufacturing centre</li> </ul>



Advanced Manufacturing	
	of excellence at UOIT along the lines of Advanced Manufacturing Research Centre, Sheffield UK
<b>What is The City of Oshawa's current ability to capitalize on sector opportunities?</b>	<ul style="list-style-type: none"> <li>■ Oshawa's manufacturing sector is diversified enough to capitalize on growth markets such as resources and energy. It is rather less well placed in medical devices, based on a limited local base of companies</li> <li>■ Global reach means companies can benefit from growth in emerging economies</li> <li>■ Combined with research capacity, Oshawa has the beginnings of a company base to capitalize on emerging technologies in additive manufacturing, advanced materials, robotics IT technology integration, and supply chain management. Bio-manufacturing opportunities may be available based on regional agri-business strengths and feedstock availability.</li> <li>■ Less well placed to capitalize on semi-conductor developments due to an absence of manufacturing activity compared to rest of GTA, and offshore in Japan/China.</li> <li>■ <b>Major opportunity to be a leading advanced manufacturing centre in the Province and in Canada through potential development of research centre at UOIT</b></li> </ul>
<b>Estimated 1-3 year sector growth</b>	<ul style="list-style-type: none"> <li>■ Sustained but modest growth (KPMG: Global Manufacturing Outlook 2012)</li> <li>■ MFG.com survey respondents in 2012 (US) were cautiously optimistic</li> <li>■ Traditional manufacturing shakeout will continue</li> <li>■ Manufacturing re-shoring could produce small gains</li> <li>■ Growth opportunities will emerge through new technologies and processes and new markets</li> </ul>
<b>Estimated 4-7 year sector growth</b>	<ul style="list-style-type: none"> <li>■ Growth prospects depend on harnessing emerging technology, materials and process opportunities as disruptive technologies take hold; limited prospects for industry if they are not</li> <li>■ Developing economies will continue to drive growth in manufactured goods</li> </ul>
<b>Complement to existing local business base</b>	<ul style="list-style-type: none"> <li>■ Strong compliment providing synergistic growth opportunities for key target sectors in energy, health, logistics, and ICT</li> </ul>
<b>Synergies with regional capabilities</b>	<ul style="list-style-type: none"> <li>■ Oshawa can draw on bio-manufacturing opportunities through its rural hinterland, and target sector</li> </ul>





Advanced Manufacturing		
	company concentrations in neighbouring urban centres: Whitby, Ajax, and Pickering.	
<b>Desired future situation for Oshawa</b>	<ul style="list-style-type: none"> <li>■ Advanced manufacturing leader with Centre of Excellence at UOIT and Durham College as anchors supporting a significant base of technology driven companies</li> </ul>	
<b>Local champions</b>	<ul style="list-style-type: none"> <li>■ Cimatrix</li> <li>■ Minacs</li> <li>■ Cleeve Technology Incorporated</li> <li>■ Nu Flow</li> <li>■ EHC Global</li> <li>■ Velcan Forest Products</li> <li>■ Rider Tool and Manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>■ P.R. Engineering Limited</li> <li>■ Enable Interconnect Inc.</li> <li>■ GeoSight</li> <li>■ Raglan</li> <li>■ General Motors</li> <li>■ P.R. Engineering Limited</li> <li>■ Premier Elevator</li> </ul>
<b>How does this sector align with regional, provincial and national sector initiatives?</b>	<ul style="list-style-type: none"> <li>■ Tech-based manufacturing is one of Durham Region's target sectors</li> <li>■ Aerospace, Automotive, nanotechnology, materials, mining are target sectors for Invest in Ontario</li> <li>■ Innovation funding initiatives such as Ontario Research Fund, various programs to help companies export. Energy Connections initiative links SMEs with Alberta's oil &amp; gas industry</li> <li>■ R&amp;D tax incentive programs available at Provincial and Federal level</li> <li>■ 2013 federal budget announced \$200 million over five years for a new Advanced Manufacturing Fund, to be delivered by Federal Economic Development Agency for Southern Ontario the as part of its renewed funding. Automotive Innovation Fund supports strategic, large-scale R&amp;D projects aimed at building more fuel-efficient vehicles</li> <li>■ Aerospace, Automotive, bio-products, machinery and equipment are among DFAIT's target sectors</li> </ul>	
<b>Capitalizes on these competitive advantages</b>	<ul style="list-style-type: none"> <li>■ Research and education base: extensive range of engineering programs including automotive, manufacturing, and materials science, as well as trades programs</li> <li>■ Industry ready graduate output through education institutions</li> <li>■ Diversified manufacturing capabilities</li> </ul>	<ul style="list-style-type: none"> <li>■ Global reach of manufacturing base</li> <li>■ Existing and potential transportation infrastructure</li> <li>■ Access to significant regional, national and provincial markets</li> <li>■ Cost advantages over most regions in GTA</li> </ul>



Advanced Manufacturing	
	<ul style="list-style-type: none"> <li>▪ Cutting edge technology through research and key companies</li> </ul>
<b>Be aware of these competitive disadvantages</b>	<ul style="list-style-type: none"> <li>▪ Known for Automotive</li> <li>▪ Lack of awareness of scale and scope of other manufacturing activities and research and innovation</li> <li>▪ On periphery of GTA region</li> <li>▪ More funding opportunities available in neighbouring Eastern Ontario</li> </ul>
<b>Who is the competition?</b>	<ul style="list-style-type: none"> <li>▪ Kitchener-Waterloo: significant strengths in advanced manufacturing technologies with an internationally renowned university</li> <li>▪ Hamilton: similar situation of an industrial legacy that is targeting advanced manufacturing</li> <li>▪ International: Southern U.S. has highly competitive sub-sectors that can be driven by financial incentives</li> </ul>
<b>Best Practice</b>	<p><b>Advanced Manufacturing Research Centre, Sheffield UK – model industry and academia partnership</b></p> <ul style="list-style-type: none"> <li>▪ A world-class centre for advanced machining and materials research for aerospace and other high-value manufacturing sectors. It is a partnership between industry and academia, which has become a model for research centres worldwide. The AMRC now forms the core of the University of Sheffield AMRC group, Namtec provides training and consultancy to the UK metals manufacturing supply chain; the Knowledge Transfer Centre, which opened in early 2012 to help us engage businesses along the manufacturing supply chain. The new AMRC Training Centre, which will provide advanced apprenticeship and higher training from 2013.</li> <li>▪ The Advanced Manufacturing Park (AMP) is the UK's premier advanced manufacturing technology park, includes a Technology Centre which provides flexible serviced office and workshop accommodation to manufacturing, engineering and sustainable energy companies located in two purpose designed buildings. A range of virtual office services with a postal address and professional telephone answering services, professional meeting rooms and conference facilities are also available.</li> </ul> <p><b>Community integrated advanced manufacturing structure with industry, public sector and</b></p>



<b>Advanced Manufacturing</b>	
	<p><b>academia in partnership</b></p> <ul style="list-style-type: none"> <li>■ A not-for-profit, public-private regional foreign direct investment partnership that markets the competitive advantages of the Waterloo Region to the world, to attract businesses, investment and talent to the Region. The Waterloo region has established a Manufacturing Innovation Network, an online manufacturing portal community –to improve communication and productivity in the manufacturing sector.</li> </ul>
<b>What should be done next?</b>	<ul style="list-style-type: none"> <li>■ Develop Advanced Manufacturing Technology Strategy</li> <li>■ Engage with UOIT, OCI and Oshawa Chamber to develop strategy and plans for an Advanced Manufacturing Research Centre at UOIT.</li> <li>■ Expand advanced manufacturing support infrastructure through the creation of organizations based on the Communitech model, in conjunction with an advanced manufacturing strategy</li> <li>■ Develop investment attraction programs around:               <ul style="list-style-type: none"> <li>● Resource based industries, and compliments to other target sectors: energy, auto innovation, medical devices</li> <li>● New emerging technologies that complement existing research and company base, and explore others for potential synergies</li> </ul> </li> <li>■ Leverage research base in advanced materials, robotics to develop and attract companies</li> <li>■ Carry out a detailed technology audit of the company base to identify how they can leverage new and emerging technologies in conjunction with support structures (could be integrated into survey of businesses)</li> <li>■ Encourage participation in export initiatives</li> <li>■ Work with Durham Region on leveraging agricultural sector on industrial biotechnology and bio-product initiatives; engage GM on any bio-material initiatives</li> </ul>



## Health and Biosciences

<p><b>What are the key trends in this sector</b></p>	<p><b>Government cost management initiatives are having an effect: (Canadian Institute for Health Information)</b></p> <ul style="list-style-type: none"><li>■ Total health care spending in Canada is expected to reach \$207 billion in 2012, though that rate of growth is slowing. The proportion of Canada's gross domestic product (GDP) spent on health care will reach 11.6% this year—down from 11.7% in 2011 and an all-time high of 11.9% in 2010.</li><li>■ Growth rate for drug spending will fall to 3.3% in 2012, down from 4% in 2011</li><li>■ Provincial governments are focused on controlling health care costs</li><li>■ Cost management initiatives such as lean projects to improve efficiencies in delivering care and changes to generic drug pricing policies are central to health care systems</li><li>■ Health system decision-makers will face the challenge of finding appropriate care for older Canadians that balances access, quality and appropriateness of care on the one hand and cost on the other</li></ul> <p><b>Soaring chronic disease burden fuelled by demographics and medical advances:</b></p> <ul style="list-style-type: none"><li>■ Blurring boundaries in healthcare: clinical advances are rendering previously fatal diseases chronic</li><li>■ Self-medication sector is expanding</li><li>■ Governments focus on prevention rather than treatment</li><li>■ Regulators more cautious about approving innovative medicines</li></ul> <p><b>Technology will drive healthcare productivity and the need to get products to market faster:</b></p> <ul style="list-style-type: none"><li>■ The virtualization of R&amp;D is emerging</li><li>■ Semantic technologies and computer-aided molecule design</li><li>■ Wider availability and accuracy of biomarkers for diagnosis and treatment: The number and size of the clinical studies will contract</li><li>■ Pervasive monitoring will enable real-time tracking of patients irrespective of their location</li><li>■ Big data is impacting health and bio-informatics in data collection and analysis</li><li>■ Approval of new medicines will be a cumulative process, based on the gradual accretion of data</li></ul>
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<b>Health and Biosciences</b>	
	<p><b>The need for new business models to succeed:</b></p> <ul style="list-style-type: none"> <li>■ Collaboration to bring treatments to the market</li> <li>■ Pay for performance</li> <li>■ Research base is shifting to Asia</li> </ul> <p><b>Canadian Life Sciences Industry Forecast 2013 (PWC/BioteCanada):</b></p> <ul style="list-style-type: none"> <li>■ Short-term confidence has declined slightly due to the difficulty of raising capital</li> </ul>
<b>Sub-Sector Assessment</b>	<ul style="list-style-type: none"> <li>■ Sector strengths are derived from institutional (rather than corporate) base. <b>Lakeridge Health is a leader in Care, Research and Education:</b> <ul style="list-style-type: none"> <li>● The scale of education and research activities is well beyond those of peer hospitals and approaching the level of medical academies such as UTM in Mississauga (provides clinical, research and undergraduate programs)</li> <li>● Future vision includes development of a satellite inter-professional health sciences centre and Invest in leading facilities, equipment, technology and information technology</li> <li>● Global recognition for Oncology. Central East Regional Cancer Program delivering care to more than 100,000 families in Durham Region and surrounding areas. Collaboration with NCIC Clinical Trials Group at Queen’s University, Ontario Clinical Oncology Group, and Canadian Institutes of Health Research</li> <li>● Innovation driven; first hospital in Canada to launch a fully integrated digital pathology system.</li> <li>● Diverse urban and rural catchment area stretching from Scarborough in the West to Cobourg in The East</li> </ul> </li> <li>■ <b>Community Health Care Delivery:</b> Presence of several organizations delivering care to address mental health, children’s special needs, and elder care provides a practical knowledge base</li> <li>■ <b>Bio/Health informatics:</b> Very significant research capacity at UOIT’s Health Education Technology Research Unit (HETRU) focuses on evidence-Based Research through the use of technology in health care and integrated health information systems. Master of Health Sciences (MHSc) - Health Informatics program at UOIT</li> </ul>



<b>Health and Biosciences</b>	
	<ul style="list-style-type: none"> <li>■ <b>Medical Devices:</b> Very small group of companies: 5 Minds start-up example of a company helped by SPARK, and MCM Biosciences. Synergies with manufacturing (e.g. Cleeve Technologies, a diversified advanced manufacturing company that provides services to the sector). Dr. Carolyn McGregor (UOIT Canada Research chair) is the Canadian representative for the IEEE Engineering in Medicine and Biology Society (EMBS). Durham College provides advanced diploma in Medical Bioengineering Technologies.</li> <li>■ The remainder of the ecosystem is comprised of locally facing entities covering everyday health needs: dental, devices etc.</li> <li>■ <b>Biotechnology/Pharmaceuticals:</b> Extensive internationally recognized clinical trial program at LHEARN, the Lakeridge Health Education and Research Network:               <ul style="list-style-type: none"> <li>● Some trials are sponsored by leading global companies such as Pfizer, Eli-Lilly, Merck, Amgen</li> <li>● One of only a few sites to be selected to participate in specific clinical trials at an international, national and provincial level</li> <li>● Partnerships with over 80 post-secondary institutions. Lakeridge Health has partnered with more than 80 post-secondary institutions, including Durham College, the University of Ontario Institute of Technology, together with major life science centres of Queen's University, and University of Toronto.</li> </ul> </li> <li>■ No major companies in the biotechnology/pharmaceuticals sector</li> <li>■ Good education base with graduate output covering health and biotechnology disciplines</li> </ul>
<b>What is The City of Oshawa's current ability to capitalize on sector opportunities?</b>	<ul style="list-style-type: none"> <li>■ Oshawa has the research and education components as a starting point for cluster development</li> <li>■ The health sector could be taken to the next level through Lakeridge Health, with the potential of a medical academy such as UTM in Mississauga</li> <li>■ Capitalizing on the sector depends on the ability to leverage strengths at Lakeridge, and education institutions rather than from the small company base</li> <li>■ Graduate output provides skills across health and bioscience areas</li> <li>■ The City can also draw on initiatives to develop the manufacturing and logistics sectors, to strengthen the health and biosciences sector</li> </ul>



Health and Biosciences			
	<ul style="list-style-type: none"> <li>Strength in growth area of health informatics</li> </ul>		
<b>Estimated 1-3 year sector growth</b>	<ul style="list-style-type: none"> <li>Cost containment will continue in health care sector spending</li> <li>Difficulty raising capital among Canadian SMEs in biotechnology sector will limit growth</li> <li>Technology driven healthcare applications such as health/bio-informatics and smart medical devices will grow</li> </ul>		
<b>Estimated 4-7 year sector growth</b>	<ul style="list-style-type: none"> <li>The industry's medium-term outlook is boosted by increased sales volume and longer exclusivity for biologics, pressure to deliver better outcomes at lower prices will not ease, as macroeconomic conditions are unlikely to improve drastically, especially in the developed countries. (Deloitte: 2013 Global life sciences outlook)</li> </ul>		
<b>Complement to existing local business base</b>	<ul style="list-style-type: none"> <li>Evidence of compliments in logistics (Syncreon) and medical devices (Cleeve Technologies). There is much potential to extend synergies and impact on the existing business base.</li> </ul>		
<b>Synergies with regional capabilities</b>	<ul style="list-style-type: none"> <li>The sector sits in the context of the GTA region: 4<sup>th</sup> largest biotech /health research cluster in North America</li> <li>Lakeridge Hospital has partnerships with the University of Toronto and Queen's University, and undertakes clinical trials for major pharmaceutical companies with Canadian HQs in GTA</li> <li>Potential industrial biotechnology synergies with agri-food in Durham Region</li> </ul>		
<b>Desired future situation for Oshawa</b>	<ul style="list-style-type: none"> <li>A growing innovative suburban cluster built around Lakeridge Health and research capacity</li> </ul>		
<b>Local champions</b>	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> <ul style="list-style-type: none"> <li>Lakeridge Health</li> <li>Lakeridge Health Education and Research Network (LHEARN)</li> <li>Grandview Children's Centre</li> <li>Enterphase Child and Family Services</li> <li>Health Education Technology Research Unit</li> </ul> </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> <li>MCM Biosciences</li> <li>5 Minds</li> <li>Cleeve Technology</li> <li>Syncreon</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li>Lakeridge Health</li> <li>Lakeridge Health Education and Research Network (LHEARN)</li> <li>Grandview Children's Centre</li> <li>Enterphase Child and Family Services</li> <li>Health Education Technology Research Unit</li> </ul>	<ul style="list-style-type: none"> <li>MCM Biosciences</li> <li>5 Minds</li> <li>Cleeve Technology</li> <li>Syncreon</li> </ul>
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Health and Biosciences	
	(HETRU)
<b>How does this sector align with regional, provincial and national sector initiatives?</b>	<ul style="list-style-type: none"> <li>■ Durham Region is not actively targeting health and biotechnology</li> <li>■ Key regional industry groups such as Life Sciences Ontario, MEDEC, which work with the Province</li> <li>■ Ontario – a key sector strongly supported by investments in health care and medical research</li> <li>■ Ontario Government’s Innovation Agenda (April 2013), includes biotechnology as a key focus area</li> <li>■ Regional and national innovation networks and centres of excellence</li> <li>■ Funding capabilities for medical devices provided by Health Technology Exchange</li> <li>■ Biopharmaceuticals and medical devices are in DFAIT’s target sectors</li> </ul>
<b>Capitalizes on these competitive advantages</b>	<ul style="list-style-type: none"> <li>■ Outstanding regional hospital with a global reputation</li> <li>■ Excellence in education and research</li> <li>■ Manufacturing synergies in medical devices</li> <li>■ Niches in oncology and health informatics</li> <li>■ Graduate output at all levels covering all aspects of life sciences</li> </ul>
<b>Be aware of these competitive disadvantages</b>	<ul style="list-style-type: none"> <li>■ Small company base</li> <li>■ Aesthetics and first impressions at major gateways to the City</li> <li>■ Lack of recognition for outstanding work at Lakeridge and UOIT</li> <li>■ Blue collar/auto image does not mesh with knowledge industries such as health and biosciences</li> </ul>
<b>Who is the competition?</b>	<ul style="list-style-type: none"> <li>■ Other communities on the periphery of the GTA looking to develop health and life sciences sector from a small base e.g. Newmarket</li> <li>■ Not in a position to take on major life sciences clusters such as Mississauga or Markham head on</li> </ul>
<b>Best Practice</b>	<ul style="list-style-type: none"> <li>■ South Lake Hospital, Newmarket worked with Venture Labs and leveraged health research centre to develop a life sciences hub harnessing innovation and commercialization opportunities. Flexibility and willingness to collaborate with central innovation agents such as MaRS has helped this process.</li> <li>■ Mississauga UTM Academy of Medicine is a partnership among U of T Mississauga, U of T’s</li> </ul>





Health and Biosciences	
	<p>Faculty of Medicine, Trillium Health Centre and Credit Valley Hospital, provides state-of-the-art classrooms, seminar rooms, computer facilities, learning spaces and laboratories.</p> <ul style="list-style-type: none"> <li>▪ Life Sciences Cluster Report 2012 Blueprint for emerging clusters: Economic development groups and public-private partnerships in emerging United States and Canadian clusters like Westchester New Haven central and southern Florida Indianapolis and Montréal offer targeted incentive packages and newly constructed state of the art incubated centres and park specialized for the industry. Beyond incentives each of these clusters have research institutions and government instituted regulations and protections with real estate available at a lower cost. The combination of Lakeridge Health, and UOIT offer the opportunity to replicate this model. Greater Boston, a leader among global life science clusters, where suburbs are an important cluster component and a viable alternative with companies wanting to avoid price constraints associated with city centres. There are parallels with the GTA in this regard.</li> </ul>
<b>What should be done next?</b>	<ul style="list-style-type: none"> <li>▪ Develop strategies and plans to translate excellence in institutional, research, and education capacity to create a sector hub</li> <li>▪ Work in tandem with Lakeridge Health to incorporate strategic vision into sector strategy focused on a broader research base, leverage private sector partnerships</li> <li>▪ Develop Health/bio Informatics initiative. Capitalize on health informatics capabilities at UOIT through investment attraction campaigns, leveraging partnerships with IBM</li> <li>▪ Develop medical devices sector by leveraging manufacturing capabilities - design, development, and manufacturing products</li> <li>▪ Work with SPARK to encourage start-ups such as 5Minds</li> <li>▪ Work with key industry associations such as Life Sciences Ontario to spread word about Oshawa's capabilities</li> <li>▪ Develop communications strategy to build awareness of Oshawa's accomplishments</li> <li>▪ Exploit synergistic capabilities in industrial bio-technology and bio-products in conjunction with Advanced Manufacturing strategy</li> </ul>



## Energy Generation

### What are the key trends in this sector

- Energy markets in Canada will continue to function well, providing adequate energy for Canadians. Electricity supply is forecast to increase to record levels, as new generating capacity is built to meet steadily increasing demand.
- Total generation capacity is projected to increase by 27 per cent to 2035, with natural gas-fired and renewable-based capacity showing the largest increases. Energy from fossil fuels will remain the dominant supply source. Sustainable energies and smart grid technologies will be a key feature of growth and innovation.
- Nuclear is expected to continue to play a key role in providing base load generation in Ontario. Annual nuclear generation is projected to increase slightly rising from 82 TW.h in 2010 to 83 TW.h in 2035. As a result of higher growth in other types of generation, such as wind and gas-fired, the share of nuclear in total electricity generation declines to 11 per cent by 2035, compared to 14 per cent in 2010.
- Natural gas power capacity in Canada is expected to increase from 18 GW in 2010 to 28 GW by 2035 driven by lower GHG emissions than coal-fired power plants, shorter construction time, lower investment costs than coal or nuclear power plants, the ability to be built in smaller increments to better match load growth, and well-developed gas supply infrastructure in Canada. The recent low price of natural gas has also enhanced the attractiveness of this form of generation. Annual gas-fired generation more than doubles rising from 50 TW.h in 2010 to 114 TW.h in 2035. The share of gas-fired generation increases from nine per cent in 2010 to 15 per cent in 2035.
- As a result of projected hydro-based capacity expansion, annual hydroelectricity production increases from 346 TW.h in 2010 to 420 TW.h in 2035. Due to faster growth in other forms of generation, such as wind-based and gas-fired generation, the share of hydroelectricity declines from 59 per cent of total generation in 2010 to 56 per cent in 2035.
- Various programs and policies encourage emerging fuels and technologies to gain market share. Over the projection period, wind power makes the largest contribution to non-hydro renewable growth with capacity quintupling over the projection period, to 23 GW in 2035. The largest capacity additions are in Quebec, Ontario and Alberta. The share of wind-based generation triples from less than two per cent of total generation to six per cent by 2035.



<b>Energy Generation</b>	
	<ul style="list-style-type: none"> <li>■ Total combined capacity of biomass, solar and geothermal is also expected to grow, with net capacity additions over the projection period of over 5 400 MW, accounting for nearly six per cent of total generation by 2035.</li> <li>■ The addition of more renewable-based capacity, such as wind, hydro and biomass, as well as the application of carbon capture and storage (CCS) technology, reduce the emissions intensity of the electricity sector</li> <li>■ Factors which could impact the choice of generation options and the generation mix in the future include:               <ul style="list-style-type: none"> <li>● Technological developments, new policies, and changing prospects of fuel supply and fuel prices</li> <li>● Social and local acceptability of electricity infrastructure projects</li> <li>● Fuel and overall capital costs</li> <li>● Non-hydro renewables, such as wind and solar power deployment is supported in some markets by financial incentives such as feed-in-tariffs</li> <li>● Reliability concerns for how much variable renewable-based generation may be integrated into a power system</li> <li>● Reduction or elimination of incentives without a corresponding cost reduction due to technological improvement, or grid integration issues, may constrain growth of these generation sources</li> <li>● Government regulation and policies impacting investments and operations of power plants continue to evolve</li> </ul> </li> </ul>
<b>Sub-Sector Assessment</b>	<ul style="list-style-type: none"> <li>■ Major company representation delivering all types of traditional fuel generation:               <ul style="list-style-type: none"> <li>● OPG operator of nuclear, hydro and geothermal energy for the Province</li> <li>● Enbridge Gas Distribution - Canada's largest gas distribution utility</li> <li>● H2O Power - Third largest provider of hydroelectric power in Ontario</li> <li>● Oshawa PUC Network: utility for Oshawa</li> </ul> </li> <li>■ Energy mix provided by companies in the City balances expected growth in gas generation, and</li> </ul>



## Energy Generation

slower growth in nuclear generation

- Sustainable energy solutions delivered through new technologies:
  - Innovative Solutions deploys systems, software and technologies to help companies optimize their energy usage
  - EV Fern designs and builds high density lithium battery systems and energy storage charging stations, inverters and plugs
  - Energy optimization services provided by EN-pro
- Very little evidence of renewable energy providers, except a limited share through major utilities and operators, and small providers of micro-scale solutions to the residential market. Sub-sector strength is found through research capacity at UOIT.
- Oshawa is home to a leading energy research and development and education complex, with particular strengths in nuclear and broad scope covering traditional and renewable energy generation.
- UIOT is a member of The University Network of Excellence in Nuclear Engineering (UNENE), site of Clean Energy Research Laboratory (CERL) Energy Systems and Nuclear Science Research Centre (ERC) R&D in geothermal, hydraulic, hydrogen, natural gas, nuclear, solar and wind energies, with the largest geothermal well field in North America.
- Energy education programs at all levels with particular strengths in nuclear engineering: UOIT's Nuclear Engineering program features the most extensive nuclear power plant computer simulation of any engineering program in Ontario
- Potential to strengthen prowess in nuclear due to proposal by Organization of Canadian Nuclear Industries to create a nuclear centre of excellence as part of a major advanced manufacturing research facility along the lines of Nuclear AMREC in Sheffield, UK
- Major professional services presence with AMEC and a few other smaller firms, but the majority are located in Darlington and Pickering providing specialist nuclear services
- Oshawa is part of a major regional energy cluster dominated by nuclear energy
- Significant support in professional and technical services from major global firms, Durham Strategic Energy Alliance and the Organization of Canadian Nuclear Industries, a pro-active industry association



Energy Generation			
<b>What is The City of Oshawa's current ability to capitalize on sector opportunities?</b>	<ul style="list-style-type: none"> <li>■ Oshawa is in a strong position to leverage traditional energy opportunities through its company base and considerable research capacity</li> <li>■ Best placed to capitalize on nuclear sector, which could elevate the City's stature further through a proposed national nuclear centre of excellence, an adjunct to an advanced manufacturing facility. Manufacturing opportunities through refurbishment could be constrained by supply chains that are already in place on the part of three firms appointed to deliver projects</li> <li>■ Opportunities in sustainable energy solutions are also available to the City</li> <li>■ Renewable energy opportunities can be capitalized on through its research base and graduate output and synergies with manufacturing sector</li> </ul>		
<b>Estimated 1-3 year sector growth</b>	<ul style="list-style-type: none"> <li>■ Energy generation is expected to increase in line with demand</li> <li>■ Regional exposure to nuclear could temper growth opportunities as gas plants gain more favour</li> <li>■ The demand for sustainable energy applications will continue to be strong</li> <li>■ Renewable energy will continue to grow as supplementary energy sources subject to Government incentives</li> </ul>		
<b>Estimated 4-7 year sector growth</b>			
<b>Complement to existing local business base</b>	<ul style="list-style-type: none"> <li>■ Strong compliment to manufacturing base and alignment with research activities</li> </ul>		
<b>Synergies with regional capabilities</b>	<ul style="list-style-type: none"> <li>■ Key part of regional energy ecosystem as the education and research leader</li> </ul>		
<b>Desired future situation for Oshawa</b>	<ul style="list-style-type: none"> <li>■ Key provincial diversified energy cluster reflecting Ontario's energy mix</li> <li>■ Establishment of larger nuclear/energy centre of excellence providing sector development based on UK and South Carolina models described in best practice below</li> <li>■ Anchored by research capacity with increased representation of sustainable energy companies, with robust manufacturing and professional services support to the sector</li> </ul>		
<b>Local champions</b>	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> <ul style="list-style-type: none"> <li>■ Oshawa PUC Networks</li> <li>■ H2O Power</li> </ul> </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> <li>■ UIOT Energy Systems and Nuclear Science Research Centre UOIT – Faculty of Energy</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li>■ Oshawa PUC Networks</li> <li>■ H2O Power</li> </ul>	<ul style="list-style-type: none"> <li>■ UIOT Energy Systems and Nuclear Science Research Centre UOIT – Faculty of Energy</li> </ul>
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Energy Generation		
	<ul style="list-style-type: none"> <li>▪ Enbridge</li> <li>▪ OPGEV FERN</li> <li>▪ Innovative Solutions</li> <li>▪ En-pro</li> </ul>	<ul style="list-style-type: none"> <li>▪ Systems and nuclear science</li> <li>▪ School of Skilled Trades, Apprenticeship &amp; Renewable Technology (START) Durham College</li> </ul>
<b>How does this sector align with regional, provincial and national sector initiatives?</b>	<ul style="list-style-type: none"> <li>▪ The Organization of Canadian Nuclear Industries (OCI) received \$142,125 funding from the Government of Canada's Global Opportunities for Associations (GOA) program to help create new opportunities for Canadian nuclear equipment and services companies in targeted export markets</li> <li>▪ Energy among Durham Region's Target sectors; Durham Strategic Energy Alliance, produces 30% of Ontario's energy supply</li> <li>▪ Clean energy is one of Invest Ontario's target sectors</li> <li>▪ Ontario's Long-Term Energy Plan key part of economic agenda – nuclear new build postponed in current version to be reviewed in three years</li> <li>▪ Trade: OCI and MEDTE led a nuclear mission to the UK to explore supply chain opportunities</li> <li>▪ Not a DFAIT target sector</li> </ul>	
<b>Capitalizes on these competitive advantages</b>	<ul style="list-style-type: none"> <li>▪ Established energy cluster as part of Durham Region</li> <li>▪ Representation of all forms of traditional energy generation vital to the economy</li> <li>▪ Emergence of sustainable energy companies</li> <li>▪ Renewable energy innovation through research and education capabilities</li> <li>▪ Industry support structure available locally and regionally</li> <li>▪ Industry – academia collaboration e.g. OPG/UOIT; Innovative Solutions/Durham College</li> <li>▪ Significant research capacity</li> <li>▪ Industry ready graduates at all levels</li> </ul>	
<b>Be aware of these competitive disadvantages</b>	<ul style="list-style-type: none"> <li>▪ Nuclear companies gravitate to sites at Darlington and Pickering</li> <li>▪ Durham Region has a stronger profile in sector due to DRSA</li> <li>▪ Advantages far outweigh the disadvantages</li> </ul>	
<b>Who is the</b>	<ul style="list-style-type: none"> <li>▪ Eastern Ontario – Peterborough, Port Hope</li> </ul>	



Energy Generation	
<b>competition?</b>	<ul style="list-style-type: none"> <li>■ Kitchener-Waterloo</li> <li>■ The Bruce ECO-Industrial Park, Kincardine and Port Elgin, Bruce County</li> <li>■ Some locations are building energy clusters around renewables, while others are bundling energy and environment.</li> <li>■ Some with strengths in nuclear such as Kitchener-Waterloo do not overtly promote the fact.</li> </ul>
<b>Best Practice</b>	<ul style="list-style-type: none"> <li>■ <b>The Nuclear Advanced Manufacturing Research Centre</b> is led by the University of Sheffield and The University of Manchester, with Rolls-Royce as lead industrial partner. Other founding partners are AREVA, Westinghouse, Sheffield Forgemasters and Tata Steel. The Nuclear AMRC operates extensive research, production and business support facilities in South Yorkshire and Manchester to provide supply chain development, training, R&amp;D, and business support.</li> <li>■ <b>Carolinas' Nuclear Cluster:</b> supports the economic development of the Carolinas through the nuclear energy industry. Energy Production &amp; Infrastructure Center provides Curriculum Development and Support, R&amp;D Projects, Internships, Adjunct Professors, Grants &amp; Scholarships. The Nuclear Cluster's plans include building its supply chain in the Carolinas so it can do even more to export products and services multi-nationally, bringing dollars back to the Carolinas.</li> </ul>
<b>What should be done next?</b>	<ul style="list-style-type: none"> <li>■ Engage with UOIT, DSEA, OCI and Oshawa Chamber to develop strategy and plans for integrating Nuclear/energy as part of potential Advanced Manufacturing Research Centre at UOIT. Investigate the potential for a range of services to include to provide supply chain development, training, R&amp;D, and business support, including incubators</li> <li>■ Leverage Energy Research Centre (ERC) commercialization partnerships to develop company base</li> <li>■ Leverage industry partnerships with OPG, Cameco etc. to facilitate business expansion and attraction</li> <li>■ Build on fledgling sustainable energy sector through business attraction and expansion e.g. work with SPARK to create new start-ups and grow businesses</li> <li>■ Develop supply chain opportunities across energy spectrum to boost synergies with manufacturing sector– work with Enbridge, OPG, H2O Power</li> </ul>





## Multimodal Transportation and Logistics

<p><b>What are the key trends in this sector</b></p>	<ul style="list-style-type: none"><li>■ <b>Changing parameters</b> in manufacturing, global sourcing, investment, technology and security are driving new distribution investment strategies</li><li>■ <b>Accelerating Globalization</b> has resulted in structural shifts in supply chain management. Manufacturers, retailers and natural resources industries are relying on their logistics networks to deliver seamless, integrated, secure, reliable and efficient solutions to leverage their global value chains through the allocation of different parts of the production process across different countries</li><li>■ <b>Sharp increase in international trade:</b> Innovations in logistics and changes in policies in countries around the world have led to a reduction in the costs of shipping goods and services across borders. The ratio of trade to GDP for the world as a whole (a commonly-used measure of economy openness) has increased from 39% in 1990 to 59% in 2011. The total value of global trade today exceeds US\$ 20 trillion</li><li>■ <b>Investment in distribution facilities in Canada increased dramatically</b> between 2005 and 2010, when total annual investment grew by 106% from \$674 million to \$1.39 billion; (69% adjusted growth using price index of non-residential commercial building construction), and by 123% in Ontario during the same period. In 2010 Ontario has the largest share (32%) of total distribution facility investment</li><li>■ <b>Cost Pressures:</b> Firms are seeking to establish dynamic, responsive, automated and low-cost distribution centres (DCs) that will support their logistics global business strategies. Control of transportation costs is a key focus for all players in the supply chain</li><li>■ <b>The Importance of technology:</b> Supply chain technology has been one of the fastest-growing segments in the information technology field. Sophisticated global logistics strategies have resulted in significant efficiencies with performance measurement metrics, information technology system standards and supplier relationship management practices</li><li>■ <b>Strategic mix of in-house and outsourced resources:</b> Growth trend in logistics outsourcing in non-asset based logistics services 4/5PL, customs clearance, brokerage services, and rail services. Consolidation among logistics intermediaries</li><li>■ <b>Environmental sustainability</b> driven by the need for regulatory compliance and satisfaction of customer demand</li></ul>
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Logistics	
	<ul style="list-style-type: none"> <li>■ <b>Growth in Intermodal transportation;</b> intermodal business, made up 25 % of CN's company's overall business in 2012</li> <li>■ <b>Short Sea Shipping</b> is significant component in goods movement throughout Europe. Identified by HWYH2O as providing long term sustainability for the Great Lakes / Seaway System through bypassing congested surface routes and reducing stress on urban infrastructure.</li> </ul>
<b>Sub-Sector Assessment</b>	<ul style="list-style-type: none"> <li>■ <b>Transportation infrastructure has all multi-modal elements and much potential but critical areas need improvement:</b> <ul style="list-style-type: none"> <li>● No rail access to Port</li> <li>● No Inter-modal facility nearby</li> <li>● Uncertainty and opposition around port and airport future plans</li> <li>● Airport is constrained by physical runway limitations</li> </ul> </li> <li>■ <b>Port:</b> trucking, rail and marine; limited by seasons; capable of handling Seaway Max Vessels; land availability; no direct rail access           <ul style="list-style-type: none"> <li>● Obstacles around community, land utilization, and politics, in realizing potential</li> </ul> </li> <li>■ <b>Logistics/Trucking: A handful of market leaders supplemented by smaller local operators</b></li> <li>■ <b>HQ in Oshawa:</b> Leading Canadian logistics outsourcing company are headquartered in Oshawa – Canada Cartage, Mackie Group, and Caltrans, plus Pival, TransForce</li> <li>■ Larger companies also provide support services such as freight forwarding, 3PL, fulfillment, sub-assembly, and warehousing capabilities</li> <li>■ Companies in target sectors are customers of these businesses</li> <li>■ Fragmented small business base with 35 small operators identified that are vulnerable to industry consolidation</li> <li>■ <b>Airport:</b> Small regional facility with a cohesive service network. Only full service general aviation airport serving the eastern Greater Toronto Area. Airport Business Plan Working Team” was formed in December 2012 to help better define its operations going forward. A recent proposal for a runway extension has been shelved. Limited by runway length to service private jets and freight. Turbo prop can meet urgent small freight requirements.</li> </ul>



Logistics	
	<ul style="list-style-type: none"> <li>■ <b>Rail:</b> Recognized regional centre with Canadian Pacific regional office, VIA Rail</li> <li>■ <b>Distribution Centres:</b> Limited representation of major distribution centres with Pival and Canada Post</li> <li>■ Synergies with manufacturing sector with transportation activities</li> <li>■ Potential to develop academic and research capacity in area:</li> <li>■ <b>Education:</b> MBA logistics and supply chain option at UOIT</li> <li>■ <b>Research:</b> Some interest in supply chain through staff publications at UOIT</li> </ul>
<p><b>What is The City of Oshawa's current ability to capitalize on sector opportunities?</b></p>	<ul style="list-style-type: none"> <li>■ <b>Oshawa has all the components to develop a true multi-modal logistics location through</b> a cohesive and integrated road, rail, port and, to a lesser extent, air infrastructure as part of a long-term vision.</li> <li>■ <b>Port development:</b> East Wharf Consolidation Project includes an additional berth for ships, more cargo handling space plus proposed rail spur</li> <li>■ <b>Logistics:</b> a small number of innovative technology driven companies that can facilitate business expansion and attraction</li> <li>■ <b>Rail:</b> Comprehensive CN/CP rail network with prospective CN spur to Port</li> <li>■ <b>Airport:</b> physical limitations with set-backs in runway extension proposals but growth in charter/private jets is a positive sign</li> <li>■ <b>Technology driven (ICT) support:</b> Minacs, combined with logistics companies such as Canada Cartage can be a launch pad to drive growth. Potential to be enhanced by strong commercially orientated ICT faculty at UOIT that has had some exposure to logistics, and Durham College</li> <li>■ <b>Distribution Centres:</b> Proximity to major regional facilities such as Sobey's, Loblaw's suggests potential in this area</li> <li>■ Durham Region is forecast to be one of the fastest growing regions in the GTA to 2032, which could pave the way for more regional distribution centres serving consumers.</li> <li>■ Global reach of manufacturing base is a growth driver</li> </ul>
<p><b>Estimated 1-3 year sector growth</b></p>	<ul style="list-style-type: none"> <li>■ The sector will continue to evolve and grow in response to demands for supply chain efficiencies, and globalization trends</li> <li>■ Consolidation among SMEs will continue through acquisition or failure. This could result in a</li> </ul>



Logistics	
	contraction of the company base, with the trucking sector particularly vulnerable
<b>Estimated 4-7 year sector growth</b>	<ul style="list-style-type: none"> <li>■ Growth trends will continue and could be fuelled by CETA agreement as tariffs are eliminated or reduced</li> <li>■ Increased trade with the developing world could occur</li> <li>■ Threats to global trade scenario include escalating oil prices, protectionism policies by Governments e.g. 'Made in America', which could cause retrenchment</li> </ul>
<b>Complement to existing local business base</b>	<ul style="list-style-type: none"> <li>■ Strong compliment to health industries (medical logistics), retail businesses, IT (ecommerce), and manufacturing</li> <li>■ Existing businesses provide services to key sectors in Oshawa</li> </ul>
<b>Synergies with regional capabilities</b>	<ul style="list-style-type: none"> <li>■ Compliment and competition with GTA facilities</li> <li>■ A regional enabler that can promote regional growth and adjacent areas in Eastern Ontario</li> </ul>
<b>Desired future situation for Oshawa</b>	<ul style="list-style-type: none"> <li>■ An integrated regional logistics and distribution hub working in tandem with activities of larger centres in GTA</li> <li>■ A critical component of the regional supply chain network enabling economic growth in the region</li> </ul>
<b>Local champions</b>	<ul style="list-style-type: none"> <li>■ Mackie Group, Canada Cartage, Syncreon</li> <li>■ Total Aviation &amp; Airport Solutions, Air Express, Enterprise Airlines</li> <li>■ QSL: Oshawa Stevedoring, Port of Oshawa</li> <li>■ CN, CP</li> <li>■ UOIT: Faculty of Business and Information Technology, Durham College</li> </ul>
<b>How does this sector align with regional, provincial and national sector initiatives?</b>	<ul style="list-style-type: none"> <li>■ The sector largely aligns with national, provincial and regional policies:               <ul style="list-style-type: none"> <li>● National initiatives to position to strengthen Canada's position in international commerce. Recent CETA trade agreement will increase activity</li> <li>● Canada's Economic Action Plan 2013 delivered measures to reduce red tape, cut costs, improve access to existing programs and promote Foreign Trade Zones (FTZ)</li> </ul> </li> </ul>



Logistics	
	<ul style="list-style-type: none"> <li>• Industry Canada has identified the Ontario-Quebec Continental Gateway and Trade Corridor as one of three major interconnected systems. Ontario, Quebec and the federal government will work with the private sector and other key public sector stakeholders to develop a comprehensive infrastructure, policy, and regulatory strategy with recommendations for the short, medium and longer term - to support international trade through the Continental Gateway</li> <li>• Support for Regional Initiatives: Economic Action Plan 2013, eligible categories for the Gas Tax Fund expanded to highways; short-line rail; short-sea shipping; local and regional airports.</li> <li>• Recent report by The Senate committee on Transportation and Communications recognizes the importance of regional airports in facilitating economic growth.</li> </ul> <ul style="list-style-type: none"> <li>■ Logistics is not an Invest in Canada or Ontario target sector</li> </ul>
<b>Capitalizes on these competitive advantages</b>	<ul style="list-style-type: none"> <li>■ Growth forecasts for Durham region – growing consumer base</li> <li>■ Globally facing industrial base</li> <li>■ Potential multimodal location with planned transportation infrastructure improvements</li> </ul>
<b>Be aware of these competitive disadvantages</b>	<ul style="list-style-type: none"> <li>■ Uncertainty and opposition around port, airport future plans</li> <li>■ Lack of cohesiveness in multi-modal configuration</li> <li>■ Proximity to major facilities in GTA</li> <li>■ No profile as multi-modal logistics location</li> </ul>
<b>Who is the competition?</b>	<ul style="list-style-type: none"> <li>■ Hamilton is engaged in transportation initiatives such as TransHub Ontario to leverage Hamilton/Burlington/Niagara transportation gateway, due to port, rail lines, airport and major highways.</li> <li>■ Minor competitors: Port of Prescott</li> <li>■ Halton Region has experienced significant sector growth, Milton has attracted some major distribution centres such as Target</li> </ul>



Logistics	
	<ul style="list-style-type: none"> <li>■ Oshawa can complement rather than conflict in areas such as short sea shipping</li> </ul>
<b>Best Practice</b>	<ul style="list-style-type: none"> <li>■ <b>Logistics Optimisation for Ports Intermodal: Network Opportunities, Development (LO-PINOD <a href="http://www.lopinod.eu/">www.lopinod.eu/</a>)</b> cited best practice elements of regional ports in the North Sea Region, many of which are of a similar size to Oshawa:               <ul style="list-style-type: none"> <li>● <b>Linkages:</b> efficient and sustainable multi-modal connections over land and sea</li> <li>● <b>Trans-shipment:</b> Efficient trans-shipment facilities to road, rail, inland shipping and short sea</li> <li>● <b>Infrastructure:</b> Development of port infrastructures (wharfs, cranes) to service customers effectively. Facilities for new businesses that need to move products by water</li> <li>● <b>Business opportunities:</b> Working in partnership to secure new business and new services</li> <li>● <b>Promotion:</b> Effective promotion of the port network to the transport-buying community</li> <li>● <b>Port management:</b> Sharing of knowledge and skills to enhance core capabilities such as security, safety, and freight handling and management services</li> <li>● <b>Community:</b> Establishing mutually beneficial links with the local community</li> </ul> </li> <li>■ <b>Alliance, Texas - Mixed Use Community around a port</b> - AllianceTexas integrates corporations, transportation systems, shopping destinations and neighbourhoods into a unique master-planned community</li> <li>■ <b>Hamilton International Airport</b> is Canada’s largest multi-modal cargo airport in Canada. Situated along two NAFTA super-corridors, the Airport’s strategic location, 24/7 operations and 24-hour Canada Customs operations provide significant benefits for goods movement</li> <li>■ <b>Raritan Center New Jersey Freight Village Concept:</b> Add-a-freight village’ model with brownfield sites of sufficient scale and in appropriate strategic locations in Oshawa and Hamilton cited for such development. (An Exploration of the Freight Village Concept and its Applicability to Ontario - McMaster Institute of Transportation and Logistics)</li> <li>■ <b>Houston Trickle-down economics:</b> Home Depot established a 755,000 square foot distribution facility at Cedar Crossing Business Park near the Port of Houston; the “big fish” proved that an intermodal logistics model could work there. The park has developed a flexible zoned master plan</li> </ul>



Logistics	
	<p>that permits properties as small as two acres, attracting not only small- and medium-sized firms, but also a 2 million square foot Walmart Import Centre</p> <ul style="list-style-type: none"> <li>▪ <b>Atlanta – Education Leadership:</b> Metro-Atlanta created the Supply Chain Leadership Council to drive economic expansion through supply chain leadership. Provides a focal point to mobilize and connect the business community. Globally focused Logistics Institute (TLI) at Georgia Tech. Hosted 3PL Summit for 3<sup>rd</sup> consecutive year. Their site serves as a sector resource.</li> </ul>
<b>What should be done next?</b>	<ul style="list-style-type: none"> <li>▪ Sector development requires a long-term regional vision to create a strategic multi-modal logistics hub (that could eventually spawn an intra-modal facility). Bring together potential stakeholders including neighbouring Eastern Ontario regions</li> <li>▪ Implement a phased approach to create transportation industry demand drivers around sector: industry, consumer demand, technology, education, research</li> <li>▪ Develop ICT/technology driven components of sector by engaging Minacs, Canada Cartage and UOIT, Durham College as a first step</li> <li>▪ Work with post-secondary institutions to provide more specialist logistics education programming. Diploma/Certificate programs at Durham College</li> <li>▪ Incorporate logistics programming into undergraduate programs at UOIT</li> <li>▪ Discuss interest in building on supply chain logistics research potential referencing papers published by UOIT</li> <li>▪ Distribution Centres: Capitalize on U.S. retailers' interest in Canada and Durham region population growth. Retail Leaders Industry Association Conference (March) could be a starting point.</li> <li>▪ Engage Ontario supply chain logistics groups. HWYH20 SCL-Canada, Supply Chain Logistics Council Canada, IWLA to develop awareness of Oshawa as a logistics hub</li> <li>▪ Investigate sector synergies with existing users to stimulate demand around lands at Port of Oshawa</li> </ul>



## Information Technology

ICT	
<b>What are the key trends in this sector</b>	<p><b>Technology Trends:</b></p> <ul style="list-style-type: none"> <li>■ Big data is considered the next frontier for innovation, competition, and productivity               <ul style="list-style-type: none"> <li>● 2.5 quintillion bytes of data are created every day, 90% of the data today was created in the last two years</li> <li>● Growth sectors: financial services, Government, healthcare (bio/health informatics), retailing</li> <li>● Growth areas: social media, mobile communications, Semantic Web, location based services</li> </ul> </li> <li>■ Implementation of new technologies, including Quantum computing, Cloud Computing</li> <li>■ Companies seeking better decisions to improve competitiveness through data driven solutions</li> </ul> <p><b>Business Trends:</b></p> <ul style="list-style-type: none"> <li>■ Boundaries between ICT and other industries blurring</li> <li>■ Rationalization and consolidation of ICT businesses occurring</li> <li>■ Cyber security continues to be a pressing issue, as technology enabled processes fuel the global economy</li> <li>■ Intra-firm linkages by mergers and alliances and extensive global networks of niche players</li> <li>■ Out-sourcing and Off-shoring continue, but growth of those practices declines</li> <li>■ Polarization of ICT skills markets into design, management of business processes and less skilled operators</li> <li>■ Rapid development and adoption of micro-processor driven sensors in all walks of life</li> </ul>
<b>Sub-Sector</b>	<ul style="list-style-type: none"> <li>■ Significant proportion of sector capacity is through ICT applications deployed in other sectors:</li> </ul>



ICT	
<b>Assessment</b>	<ul style="list-style-type: none"> <li>• Advanced manufacturing: Cimetrix - 3D printing and additive manufacturing applications</li> <li>• Automotive: Minacs - Telematics solutions and big data analytics for GM through OnStar</li> <li>• Logistics: Syncreon - supply chain solutions, eCommerce order fulfillment</li> <li>• Energy: Innovative Solutions - deploys systems, software and technologies to help companies optimize their energy usage</li> <li>• Financial Services: Key applications at RBC regional office in Oshawa; 6 industry standard databases at UOIT with graduates on staff</li> </ul> <ul style="list-style-type: none"> <li>■ Research activity at UOIT is in significant growth areas:               <ul style="list-style-type: none"> <li>• METIS research group in Information Security</li> <li>• Health Education Technology Research Unit (HETRU)</li> <li>• Dr. McGregor (UOIT) has led pioneering research in Big Data, event stream processing, temporal data stream data mining, business process modelling, patient journey modelling and cloud computing</li> <li>• Collaborative work with IBM: Project Artemis, a collaborative initiative involving Toronto's Hospital for Sick Children, (UOIT) and IBM Canada to capture and analyze vast amounts of physiological data from premature babies.</li> </ul> </li> <li>■ Spin-off company activity through METIS, Ignite in Durham Region</li> <li>■ SPARK has spun off companies with local graduates but they have left Oshawa for other parts of the region</li> <li>■ Integrated business and ICT faculty at UOIT is unique in Canada, graduates have entrepreneurial and business skills</li> <li>■ Gaming development programming at Durham College and UOIT, but graduates do not generally stay in region</li> <li>■ No representation in Branham 300 except for Compute in 2006/7; ranked 138/161 respectively</li> <li>■ Significant number of regional and locally facing businesses in consulting, internet service provision</li> </ul>
<b>What is The City of Oshawa's current ability to capitalize</b>	<ul style="list-style-type: none"> <li>■ The City can capitalize on sector opportunities through ICT deployment in target sectors and research activities at UOIT</li> </ul>





ICT			
<b>on sector opportunities?</b>	<ul style="list-style-type: none"> <li>■ Research expertise in information security and big data applications, particularly in health, can be leveraged</li> <li>■ Selective targeting is required. A verticals approach aligned with target sectors will provide synergies that could eventually spin off into stand-alone ICT companies</li> </ul>		
<b>Estimated 1-3 year sector growth</b>	<ul style="list-style-type: none"> <li>■ Positive, as business models, technologies and products continue to evolve at a rapid pace combined with ROI creating demand for new and improved processes</li> <li>■ The sector will become more pervasive and will blur into other industries and daily life. Inherent entrepreneurship will continue with rapid innovation and sector convergence</li> </ul>		
<b>Estimated 4-7 year sector growth</b>	<ul style="list-style-type: none"> <li>■ Short-term trends are set to continue</li> <li>■ Importance and influence of emerging markets will be established</li> </ul>		
<b>Complement to existing local business base</b>	<ul style="list-style-type: none"> <li>■ Strong compliment to existing businesses through the integration of innovative processes into other sectors</li> </ul>		
<b>Synergies with regional capabilities</b>	<ul style="list-style-type: none"> <li>■ GTA is third largest cluster in North America</li> </ul>		
<b>Desired future situation for Oshawa</b>	<ul style="list-style-type: none"> <li>■ Enabler sector, facilitating growth of other target sectors through continued adoption and deployment of key technologies and support companies</li> <li>■ Strong entrepreneurial culture that builds start-ups and early stage companies in ICT growth areas</li> <li>■ Talent development from the ground up, leveraging practical education attributes of UOIT Faculty of Business and Information Technology and Durham College</li> </ul>		
<b>Local champions</b>	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <ul style="list-style-type: none"> <li>■ Minacs</li> <li>■ Canada Cartage, Innovative Solutions</li> <li>■ Three Wise Men</li> <li>■ Compute,</li> <li>■ Cimatrix Solutions</li> </ul> </td> <td style="vertical-align: top; width: 50%;"> <ul style="list-style-type: none"> <li>■ Innovative Solutions</li> <li>■ Syncreon</li> <li>■ UOIT Department of Business and Information Technology</li> <li>■ Durham College School of Business, IT &amp; Management (BITM)</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li>■ Minacs</li> <li>■ Canada Cartage, Innovative Solutions</li> <li>■ Three Wise Men</li> <li>■ Compute,</li> <li>■ Cimatrix Solutions</li> </ul>	<ul style="list-style-type: none"> <li>■ Innovative Solutions</li> <li>■ Syncreon</li> <li>■ UOIT Department of Business and Information Technology</li> <li>■ Durham College School of Business, IT &amp; Management (BITM)</li> </ul>
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ICT		
		<ul style="list-style-type: none"> <li>▪ METIS research group in Information Security</li> <li>▪ Health Education Technology Research Unit (HETRU)</li> </ul>
<b>How does this sector align with regional, provincial and national sector initiatives?</b>	<ul style="list-style-type: none"> <li>▪ Synergies at broader regional, provincial and Federal level:               <ul style="list-style-type: none"> <li>• Not a target sector for Durham Region</li> <li>• GTA - identified as one of GTMA's seven key sectors</li> <li>• Ontario - a key investment sector with specific support.</li> <li>• Canada - identified in DFAIT's sectors of concentration</li> </ul> </li> </ul>	
<b>Capitalizes on these competitive advantages</b>	<ul style="list-style-type: none"> <li>▪ Considerable innovation in business process improvement, sector based applications (e.g. Minacs)</li> <li>▪ Expertise through research in key growth areas big data (health) and information security</li> <li>▪ Unique amalgamation of business and IT at educational institutions producing industry ready and entrepreneurial graduates</li> <li>▪ Gaming development programs</li> </ul>	
<b>Be aware of these competitive disadvantages</b>	<ul style="list-style-type: none"> <li>▪ Blue collar/auto image does not mesh with knowledge industries such as ICT</li> <li>▪ Aesthetics and first impressions at major gateways to the City</li> <li>▪ Lack of awareness of capabilities</li> <li>▪ ICT strengths are 'hidden' within companies deploying applications as opposed to providing them</li> </ul>	
<b>Who is the competition?</b>	<ul style="list-style-type: none"> <li>▪ Kitchener-Waterloo, Hamilton</li> <li>▪ Head on competitive initiatives with GTA locations such and Mississauga and Markham should be avoided</li> </ul>	
<b>Best Practice</b>	<ul style="list-style-type: none"> <li>▪ <b>Communitech</b> is the regional hub for the commercialization of innovative technologies, supporting tech companies at all stages of their growth and development—from startups to rapidly growing mid-size companies and large global players. This has helped to create and support a tech cluster of 1,000 companies employing nearly 30,000 people in the Waterloo Region. In September 2013,</li> </ul>	



ICT	
	<p>Communitech became part of an exclusive <b>Google for Entrepreneurs Tech Hub Network</b>. Comprised of seven hubs throughout North America, the network will support entrepreneurs and provide a stimulus for local economies. The other North American hubs are CoCo in Minneapolis, MN; 1871 in Chicago, IL; Nashville Entrepreneur Center in Nashville, TN; American Underground in Durham, NC; Galvanize in Denver, CO; and Grand Circus in Detroit, MI</p> <ul style="list-style-type: none"><li>▪ <b>Silicon Valley Key Success Factors:</b> entrepreneurial spirit in academia and venture capital funding that is willing to take - and therefore understands - risk. Stanford University has had a <b>catalytic role</b>. Since the 1890s it has seen its job as enabling the area to be a centre for economic development and industry. Many professors have their own capital stakes in young entrepreneurs who were their own students. There are parallels with the University of Waterloo in this regard. UOIT can follow this model to develop the sector.</li></ul>
<b>What should be done next?</b>	<ul style="list-style-type: none"><li>▪ Work with Spark to build ecosystem: create and grow start-ups and university spin-offs and leverage funding capabilities of Spark Angels</li><li>▪ Promote entrepreneur and grassroots activities in ICT growth areas as a building block for long-term sector development. Engage grassroots leaders as local champions</li><li>▪ Create an ambient environment downtown that will be attractive to knowledge based businesses</li><li>▪ Build partnerships with innovative companies such as Minacs, Cimetrix to attract potential collaborative partners and investors</li><li>▪ Integrate ICT into advanced manufacturing strategy as a growth driver/enabling sector</li><li>▪ Target information security and big data companies providing services to other target sectors through integration with other sector initiatives</li></ul>



## Appendix III: Educational and Workforce Profiles

### Advanced Manufacturing

#### Advanced Manufacturing Sector - Number of Post-Secondary Programs

Number of Graduate and Undergraduate Programs		Engineering	Science	Math	Total
<b>UOIT</b>					
	Bachelor	11	7	1	19
	Masters	11			11
	Doctorate	3			3
	Others (Diploma/Cert etc.)	3			3
	<b>TOTAL</b>	<b>28</b>	<b>7</b>	<b>1</b>	<b>36</b>
<b>Toronto</b>					
	Bachelor	11	22	13	46
	Masters	12	6	2	20
	Doctorate	7	2	2	11
	Others (Diploma/Cert etc.)				
	<b>TOTAL</b>	<b>30</b>	<b>30</b>	<b>17</b>	<b>77</b>
<b>Ryerson</b>					
	Bachelor	7	1		8
	Masters	4		1	5
	Doctorate	4			4
	Others (Diploma/Cert etc.)	1			1
	<b>TOTAL</b>	<b>16</b>	<b>1</b>	<b>1</b>	<b>18</b>
<b>Trent</b>					
	Bachelor		5	4	9
	Masters		3		3



Doctorate		1		1
Others (Diploma/Cert etc.)				
<b>TOTAL</b>	<b>0</b>	<b>9</b>	<b>4</b>	<b>13</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>74</b>	<b>47</b>	<b>23</b>	<b>144</b>

Source: Association of Universities and Colleges of Canada

Number of Programs					
Institution	Advanced Manufacturing				
	Engineering Technicians	Operations Management	Trades	Science & Technology - General	Total
<b>DURHAM</b>					
CERTIFICATE		1	7		
DIPLOMA	5	1	3	1	
ADVANCED DIPLOMA	6	1			
DEGREE - BACHELOR'S					
GRADUATE CERTIFICATE					
<b>TOTAL</b>	<b>11</b>	<b>3</b>	<b>10</b>	<b>1</b>	<b>25</b>
<b>George Brown</b>					
CERTIFICATE			4	2	
DIPLOMA	3		1	1	
ADVANCED DIPLOMA	4		1		
DEGREE - BACHELOR'S					
GRADUATE CERTIFICATE					
<b>TOTAL</b>	<b>7</b>		<b>6</b>	<b>3</b>	<b>16</b>
<b>Centennial</b>					



CERTIFICATE	3		1		
DIPLOMA	11		7		
ADVANCED DIPLOMA	7				
DEGREE - BACHELOR'S					
GRADUATE CERTIFICATE		2			
<b>TOTAL</b>	<b>21</b>	<b>2</b>	<b>8</b>		<b>31</b>
<b>Seneca</b>					
CERTIFICATE			2	2	
DIPLOMA	6		1		
ADVANCED DIPLOMA	6		1		
DEGREE - BACHELOR'S					
GRADUATE CERTIFICATE	1				
<b>TOTAL</b>	<b>13</b>		<b>4</b>	<b>2</b>	<b>19</b>
<b>FLEMING</b>					
CERTIFICATE			7		
DIPLOMA	3		2		
ADVANCED DIPLOMA					
DEGREE - BACHELOR'S					
GRADUATE CERTIFICATE		1			
<b>TOTAL</b>	<b>3</b>	<b>1</b>	<b>9</b>		<b>13</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>55</b>	<b>6</b>	<b>37</b>	<b>6</b>	<b>104</b>

Source: Ontario Colleges website



### Emerging Workforce Advanced Manufacturing - Number of Enrollments by Program

	Full/Part Time					
Total Number of degree seeking students (headcount) enrolled for Fall 2011 (except where stated), including domestic and international students.	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	Total all Universities
Engineering	1,751	0	6,901	4,047	0	12,699
Mathematics	67	237	1,892	111	0	2,307
Other Arts & Science	0	2,309	11,659	219	0	14,187
Physical Science	209	154	1,500	218	10	2,091
<b>TOTAL ADVANCED MANUFACTURING</b>	<b>2,027</b>	<b>2,700</b>	<b>21,952</b>	<b>4,595</b>	<b>10</b>	<b>31,284</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

	Full/Part Time					
Number of masters degree seeking students (headcount) enrolled for Fall 2011 (except where stated), including domestic and international students.	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	Total all Universities
Engineering	124	0	1,080	550	0	1,754
Mathematics	8	0	102	22	0	132
Other Arts & Science	0	0	0	0	54	54
Physical Science	5	6	93	36	101	241
<b>TOTAL ADVANCED MANUFACTURING</b>	<b>137</b>	<b>6</b>	<b>1,275</b>	<b>608</b>	<b>155</b>	<b>2,181</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis



### Skilled Workforce Advanced Manufacturing - Number of Graduates by Program

Number of degrees conferred in the calendar year 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Engineering	227	0	1,390	677	0	2,294
Mathematics	18	20	284	11	11	344
Other Arts & Science	2	122	513	3	12	652
Physical Science	23	27	266	34	67	417
<b>TOTAL ADVANCED MANUFACTURING</b>	<b>270</b>	<b>169</b>	<b>2,453</b>	<b>725</b>	<b>90</b>	<b>3,707</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of Masters degrees conferred in the calendar year 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Engineering	67	0	391	247	0	705
Mathematics	2	0	85	10	0	97
Other Arts & Science	0	0	0	0	12	12
Physical Science	2	3	55	13	40	113
<b>TOTAL ADVANCED MANUFACTURING</b>	<b>71</b>	<b>3</b>	<b>531</b>	<b>270</b>	<b>52</b>	<b>927</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis





<b>2010-2011</b>					
<b>Community College</b>	<b>Manufacturing</b>				
	<b>Engineering Technology</b>	<b>Trades</b>	<b>Science</b>	<b>Operations Management</b>	<b>Total all Colleges</b>
<b>Durham</b>	<b>133</b>	<b>155</b>	<b>8</b>	<b>12</b>	<b>308</b>
<b>George Brown</b>	<b>67</b>	<b>101</b>	<b>37</b>	<b>0</b>	<b>205</b>
<b>Centennial</b>	<b>220</b>	<b>293</b>	<b>102</b>	<b>240</b>	<b>855</b>
<b>Seneca</b>	<b>186</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>186</b>
<b>Fleming</b>	<b>0</b>	<b>260</b>	<b>69</b>	<b>0</b>	<b>329</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>606</b>	<b>809</b>	<b>216</b>	<b>252</b>	<b>1883</b>

Source: College KPI data



## Health and Biosciences

### Health and BioSciences Sector - Number of Post-Secondary Programs

Number of Graduate and Undergraduate Programs					
Institution	Biotechnology	Bio/health informatics	Health Care Delivery	Medical Devices	Life Sciences Total
<b>UOIT</b>					
Bachelor	11		4		15
Masters	1	1	1		3
Doctorate	1				1
Others (Diploma/Cert etc.)					
<b>TOTAL</b>	<b>13</b>	<b>1</b>	<b>5</b>		<b>19</b>
<b>Toronto</b>					
Bachelor	45	2	13	1	61
Masters	6	2	30	4	42
Doctorate	13		25	3	41
Others (Diploma/Cert etc.)			7		7
<b>TOTAL</b>	<b>64</b>	<b>4</b>	<b>75</b>	<b>8</b>	<b>151</b>
<b>Ryerson</b>					
Bachelor	4	1	6	1	12
Masters	2				2
Doctorate	3		2		5
Others (Diploma/Cert etc.)		1	7		8
<b>TOTAL</b>	<b>9</b>	<b>2</b>	<b>15</b>	<b>1</b>	<b>27</b>
<b>Trent</b>					
Bachelor	8		1		9
Masters	2				2
Doctorate	1				1



Others (Diploma/Cert etc.)					
<b>TOTAL</b>	<b>11</b>		<b>1</b>		<b>12</b>

<b>TOTAL ALL INSTITUTIONS</b>	<b>97</b>	<b>7</b>	<b>96</b>	<b>9</b>	<b>209</b>
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Source: Association of Universities and Colleges of Canada

Number of Graduate and Undergraduate Programs						
Institution	Life Sciences					Total Life Sciences
	Biotechnology	Bio/health informatics	Health Care Delivery	Medical Devices	Health Administration	
<b>DURHAM</b>						
CERTIFICATE			5		2	7
DIPLOMA			6			6
ADVANCED DIPLOMA	2		2	2		6
DEGREE - BACHELOR'S						
GRADUATE CERTIFICATE			3			3
<b>TOTAL</b>	<b>2</b>		<b>16</b>	<b>2</b>	<b>2</b>	<b>22</b>
<b>George Brown</b>						
CERTIFICATE			6		2	8
DIPLOMA		1	3		1	5
ADVANCED DIPLOMA			4			4
DEGREE - BACHELOR'S						
GRADUATE CERTIFICATE		1	7			8
<b>TOTAL</b>		<b>2</b>	<b>20</b>		<b>3</b>	<b>25</b>
<b>Centennial</b>						
CERTIFICATE			4			4
DIPLOMA	3		8		1	12



ADVANCED DIPLOMA	5	4		4		13
DEGREE - BACHELOR'S						
GRADUATE CERTIFICATE			4			4
<b>TOTAL</b>	<b>8</b>	<b>4</b>	<b>16</b>	<b>4</b>	<b>1</b>	<b>33</b>
<b>Seneca</b>						
CERTIFICATE			1			1
DIPLOMA			4		2	6
ADVANCED DIPLOMA	3		2			5
DEGREE - BACHELOR'S						
GRADUATE CERTIFICATE		1	2			3
<b>TOTAL</b>	<b>3</b>	<b>1</b>	<b>9</b>		<b>2</b>	<b>15</b>
<b>FLEMING</b>						
CERTIFICATE			2			2
DIPLOMA		2	5			7
ADVANCED DIPLOMA	1					1
DEGREE - BACHELOR'S						
GRADUATE CERTIFICATE			1			1
<b>TOTAL</b>	<b>1</b>	<b>2</b>	<b>8</b>			<b>11</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>14</b>	<b>9</b>	<b>69</b>	<b>6</b>	<b>8</b>	<b>106</b>

Source: Ontario Colleges website



### Emerging Workforce Health and BioSciences - Number of Enrollments by Program

Total Number of degree seeking students (headcount) enrolled Fall 2011 (except where stated), including domestic and international students.	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
<b>LIFE SCIENCES</b>						
Agriculture & Biological Science	507	1,260	4,662	752	191	7,372
Biological Science	0	0	0	0	0	0
Other Arts & Science	0	2,309	11,659	219	12	14,199
Pharmacy	0	0	1,188	0	0	1,188
<b>Total Biotechnology related</b>	<b>507</b>	<b>3,569</b>	<b>17,509</b>	<b>971</b>	<b>203</b>	<b>22,759</b>
Medicine	862	66	3,461	31	0	4,420
Nursing	694	0	636	2,268	124	3,722
Optometry	0	0	0	0	0	0
Dentistry	0	0	451	0	0	451
<b>Total Medical Health Care Delivery</b>	<b>1,556</b>	<b>66</b>	<b>4,548</b>	<b>2,299</b>	<b>124</b>	<b>8,593</b>
Food Science & Nutrition	0	0	210	431	0	641
Kinesiology, Recreation & Phys. Educ.	0	0	803	0	0	803
Other Health Professions	146	0	873	579	0	1,598
Therapy & Rehabilitation	0	0	429	0	0	429
<b>Total Community Health Delivery</b>	<b>146</b>	<b>0</b>	<b>2,315</b>	<b>1,010</b>	<b>0</b>	<b>3,471</b>



<b>TOTAL LIFE SCIENCES</b>	<b>2,209</b>	<b>3,635</b>	<b>24,372</b>	<b>4,280</b>	<b>327</b>	<b>34,823</b>
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Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of masters degree seeking students (headcount) enrolled for Fall 2011 (except where stated), including domestic and international students.	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
<b>LIFE SCIENCES</b>						
Agriculture & Biological Science	17	18	235	0	0	270
Biological Science	0	0	0	0	0	0
Other Arts & Science	0	0	0	0	12	12
Pharmacy	0	0	44	0	0	44
<b>Total Biotechnology related</b>	<b>17</b>	<b>18</b>	<b>279</b>	<b>0</b>	<b>12</b>	<b>326</b>
Medicine	30	0	727	27	0	784
Nursing	0	0	243	170	0	413
Optometry	0	0	0	0	0	0
Dentistry	0	0	102	0	0	102
<b>Total Medical Health Care Delivery</b>	<b>30</b>	<b>0</b>	<b>1,072</b>	<b>197</b>	<b>0</b>	<b>1,299</b>
Food Science & Nutrition	0	0	44	20	0	64
Kinesiology, Recreation & Phys. Educ.	0	0	29	0	0	29
Other Health Professions	0	0	448	0	0	448
Therapy & Rehabilitation	0	0	375	0	0	375
<b>Total Community Health Delivery</b>	<b>0</b>	<b>0</b>	<b>896</b>	<b>20</b>	<b>0</b>	<b>916</b>



<b>TOTAL LIFE SCIENCES</b>	<b>47</b>	<b>18</b>	<b>2,247</b>	<b>217</b>	<b>12</b>	<b>2,541</b>
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Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

**Skilled Workforce Health and BioSciences - Number of Graduates by Program**

Number of degrees conferred in the calendar year 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
<b>LIFE SCIENCES</b>						
Agriculture & Biological Science	61	363	1,198	96	802	2,520
Biological Science	0	0	0	0	0	0
Other Arts & Science	2	122	513	3	797	1,437
Pharmacy	0	0	288	0	0	288
<b>Total Biotechnology related</b>	<b>63</b>	<b>485</b>	<b>1,999</b>	<b>99</b>	<b>1,599</b>	<b>4,245</b>
Medicine	103	27	799	8	0	937
Nursing	114	0	301	818	743	1,976
Optometry	0	0	0	0	0	0
Dentistry	0	0	124	0	0	124
<b>Total Medical Health Care Delivery</b>	<b>217</b>	<b>27</b>	<b>1,224</b>	<b>826</b>	<b>743</b>	<b>3,037</b>
Food Science & Nutrition	0	0	86	121	0	207
Kinesiology, Recreation & Phys. Educ.	0	0	116	0	0	116
Other Health Professions	14	0	330	115	0	459
Therapy & Rehabilitation	0	0	178	0	0	178
<b>Total Community Health</b>	<b>14</b>	<b>0</b>	<b>710</b>	<b>236</b>	<b>0</b>	<b>960</b>



<b>Delivery</b>						
<b>TOTAL LIFE SCIENCES</b>	<b>294</b>	<b>512</b>	<b>3,933</b>	<b>1,161</b>	<b>2,342</b>	<b>8,242</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of Masters degrees conferred in the calendar year 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
<b>LIFE SCIENCES</b>						
Agriculture & Biological Science	10	12	77	0	0	99
Biological Science	0	0	0	0	0	0
Other Arts & Science	0	0	0	0	54	54
Pharmacy	0	0	14	0	0	14
<b>Total Biotechnology related</b>	<b>10</b>	<b>12</b>	<b>91</b>	<b>0</b>	<b>54</b>	<b>167</b>
Medicine	10	0	203	8	0	221
Nursing	0	0	127	44	0	171
Optometry	0	0	0	0	0	0
Dentistry	0	0	29	0	0	29
<b>Total Medical Health Care Delivery</b>	<b>10</b>	<b>0</b>	<b>359</b>	<b>52</b>	<b>0</b>	<b>421</b>
Food Science & Nutrition	0	0	17	19	0	36
Kinesiology, Recreation & Phys. Educ.	0	0	10	0	0	10
Other Health Professions	0	0	181	0	0	181
Therapy & Rehabilitation	0	0	171	0	0	171





<b>Total Community Health Delivery</b>	0	0	379	19	0	398
<b>TOTAL LIFE SCIENCES</b>	<b>20</b>	<b>12</b>	<b>829</b>	<b>71</b>	<b>54</b>	<b>986</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

2012							
Community College	Life Sciences						Total all Colleges
	Biotechnology	Bioinformatics	Health Care Delivery	Bioengineering	Community Health Care	Admin	
Durham	72	0	241	16	132	114	575
George Brown	0	39	857	0	378	83	1357
Centennial	430	0	341	0	352	59	1182
Seneca	53	10	123	0	117	99	402
Fleming	34	29	113	0	170	0	346
<b>TOTAL ALL INSTITUTIONS</b>	<b>589</b>	<b>78</b>	<b>1675</b>	<b>16</b>	<b>1149</b>	<b>355</b>	<b>3,862</b>

Source: College KPI data



## Energy Generation

### Energy Generation Sector - Number of Post-Secondary Programs

Number of Graduate and Undergraduate Programs		Number of Graduate and Undergraduate Programs	
Institution	ENERGY	Institution	Energy
<b>UOIT</b>		<b>DURHAM</b>	
Bachelor	3	CERTIFICATE	
Masters	3	DIPLOMA	1
Doctorate	1	ADVANCED DIPLOMA	1
Others (Diploma/Cert etc.)	2	DEGREE - BACHELOR'S	
<b>TOTAL</b>	<b>9</b>	GRADUATE CERTIFICATE	
<b>Toronto</b>		<b>TOTAL</b>	<b>2</b>
Bachelor	2	<b>George Brown</b>	
Masters		CERTIFICATE	
Doctorate		DIPLOMA	
Others (Diploma/Cert etc.)		ADVANCED DIPLOMA	
<b>TOTAL</b>	<b>2</b>	DEGREE - BACHELOR'S	
<b>Ryerson</b>		GRADUATE CERTIFICATE	
Bachelor		<b>TOTAL</b>	
Masters		<b>Centennial</b>	
Doctorate		CERTIFICATE	
Others (Diploma/Cert etc.)	1	DIPLOMA	2
		ADVANCED DIPLOMA	2
		DEGREE - BACHELOR'S	



<b>TOTAL</b>	<b>1</b>
<b>Trent</b>	
Bachelor	
Masters	
Doctorate	
Others (Diploma/Cert etc.)	
<b>TOTAL</b>	
<b>TOTAL ALL INSTITUTIONS</b>	<b>12</b>

Source: Association of Universities and Colleges of Canada

GRADUATE CERTIFICATE	
<b>TOTAL</b>	<b>4</b>
<b>Seneca</b>	
CERTIFICATE	
DIPLOMA	
ADVANCED DIPLOMA	
DEGREE - BACHELOR'S	
GRADUATE CERTIFICATE	1
<b>TOTAL</b>	<b>1</b>
<b>FLEMING</b>	
CERTIFICATE	
DIPLOMA	
ADVANCED DIPLOMA	
DEGREE - BACHELOR'S	
GRADUATE CERTIFICATE	
<b>TOTAL</b>	
<b>TOTAL ALL INSTITUTIONS</b>	<b>7</b>

Source: Ontario Colleges website



### Emerging Workforce Energy Generation - Number of Enrollments by Program

Total Number of degree seeking students (headcount) enrolled for Fall 2011 (except where stated), including domestic and international students.	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Agriculture & Biological Science	507	1,260	4,662	752	802	7,983
Engineering	1,751	0	6,901	4,047	0	12,699
Other Arts & Science	0	2,309	11,659	219	797	14,984
Physical Science	209	154	1,500	218	250	2,331
<b>TOTAL ENVIRONMENTAL/ENERGY</b>	<b>2,467</b>	<b>3,723</b>	<b>24,722</b>	<b>5,236</b>	<b>1,849</b>	<b>37,997</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of masters degree seeking students (headcount) enrolled for Fall 2011 (except where stated), including domestic and international students.	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Agriculture & Biological Science	17	18	235	0	0	270
Engineering	124	0	1,080	550	0	1,754
Other Arts & Science	0	0	0	0	54	54
Physical Science	5	6	93	36	101	241
<b>TOTAL ENVIRONMENTAL/ENERGY</b>	<b>146</b>	<b>24</b>	<b>1,408</b>	<b>586</b>	<b>155</b>	<b>2,319</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis



### Skilled Workforce - Energy Generation: Number of Graduates by Program

Number of degrees conferred in the calendar year 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Agriculture & Biological Science	61	363	1,198	96	191	1,909
Engineering	227	0	1,390	677	0	2,294
Other Arts & Science	2	122	36	3	12	175
Physical Science	23	27	513	34	67	664
<b>TOTAL ENVIRONMENTAL/ENERGY</b>	<b>313</b>	<b>512</b>	<b>3,137</b>	<b>810</b>	<b>270</b>	<b>5,042</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of Masters degrees conferred in the calendar year 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Agriculture & Biological Science	10	12	77	0	0	99
Engineering	67	0	391	247	0	705
Other Arts & Science	0	0	0	0	12	12
Physical Science	2	3	55	13	40	113
Forestry	0	0	13	0	0	13
<b>TOTAL ENVIRONMENTAL/ENERGY</b>	<b>79</b>	<b>15</b>	<b>536</b>	<b>260</b>	<b>52</b>	<b>942</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis



<b>2011-2012</b>	
<b>Community College</b>	<b>Energy</b>
<b>Durham</b>	<b>16</b>
<b>George Brown</b>	<b>0</b>
<b>Centennial</b>	<b>15</b>
<b>Seneca</b>	<b>0</b>
<b>Fleming</b>	<b>10</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>41</b>

Source: College KPI data



## Multimodal Transportation and Logistics

### Multimodal Transportation and Logistics Sector - Number of Post-Secondary Programs

Number of Graduate and Undergraduate Programs						
Institution	Logistics	Information Technology	Math	Operations Management	Business	TOTAL
<b>UOIT</b>						
Bachelor	0	7	1	0	0	8
Masters	0	3	0	0	1	4
Doctorate	0	3	0	0	0	3
Others (Diploma/Cert etc.)	0	0	0	0	0	0
<b>TOTAL</b>	<b>0</b>	<b>13</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>15</b>
<b>Toronto</b>						
Bachelor	0	8	13	0	7	28
Masters	0	4	2	0	1	7
Doctorate	0	1	2	0	1	4
Others (Diploma/Cert etc.)	0	0	0	0	1	1
<b>TOTAL</b>	<b>0</b>	<b>13</b>	<b>17</b>	<b>0</b>	<b>10</b>	<b>40</b>
<b>Ryerson*</b>						
Bachelor	0	3	0	0	3	6
Masters	1	5	1	0	1	8
Doctorate	0	2	0	0	0	2
Others (Diploma/Cert etc.)	0	6	0	1	2	9
<b>TOTAL</b>	<b>1</b>	<b>16</b>	<b>1</b>	<b>1</b>	<b>6</b>	<b>25</b>
<b>Trent</b>						
Bachelor	0	5	4	0	1	10
Masters	0	0	0	0	0	0
Doctorate	0	0	0	0	0	0



Others (Diploma/Cert etc.)	0	0	0	0	0	0
<b>TOTAL</b>	<b>0</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>10</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>0</b>	<b>47</b>	<b>23</b>	<b>1</b>	<b>18</b>	<b>90</b>

Source: Association of Universities and Colleges of Canada

\*Ryerson University's MBA and MMSc in the Management of Technology and Innovation program offers a specialization in Supply Chain Management.

Number of Programs					
Institution	Logistics Supply Chain				
	Logistics Supply Chain	Operations Management	Information Technology	Business	TOTAL
<b>DURHAM</b>					
CERTIFICATE	0	1	0	1	2
DIPLOMA	0	1	4	1	6
ADVANCED DIPLOMA	0	1	1	1	3
DEGREE - BACHELOR'S	0	0	0	0	0
GRADUATE CERTIFICATE	0	0	1	1	2
<b>TOTAL</b>	<b>0</b>	<b>3</b>	<b>6</b>	<b>4</b>	<b>13</b>
<b>George Brown</b>					
CERTIFICATE	0	0	0	1	1
DIPLOMA	0	0	1	1	2
ADVANCED DIPLOMA	2	1	2	4	9
DEGREE - BACHELOR'S	0	0	0	0	0
GRADUATE CERTIFICATE	0	0	2	2	4
<b>TOTAL</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>8</b>	<b>16</b>
<b>Centennial</b>					
CERTIFICATE	0	0	1	0	1





DIPLOMA	0	0	4	3	7
ADVANCED DIPLOMA	0	1	11	3	15
DEGREE - BACHELOR'S	0	0	0	0	0
GRADUATE CERTIFICATE	2	2	0	5	9
<b>TOTAL</b>	<b>2</b>	<b>3</b>	<b>16</b>	<b>11</b>	<b>32</b>
<b>Seneca</b>					
CERTIFICATE	0	0	0	1	1
DIPLOMA	1	0	7	3	11
ADVANCED DIPLOMA	1	0	3	4	8
DEGREE - BACHELOR'S	0	0	0	0	0
GRADUATE CERTIFICATE	1	0	4	1	6
<b>TOTAL</b>	<b>3</b>	<b>0</b>	<b>14</b>	<b>9</b>	<b>26</b>
<b>FLEMING</b>					
CERTIFICATE	0	0	0	0	0
DIPLOMA	0	0	1	1	2
ADVANCED DIPLOMA	1	0	2	2	5
DEGREE - BACHELOR'S	0	0	0	0	0
GRADUATE CERTIFICATE	0	1	4	1	6
<b>TOTAL</b>	<b>1</b>	<b>1</b>	<b>7</b>	<b>4</b>	<b>13</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>8</b>	<b>8</b>	<b>48</b>	<b>36</b>	<b>100</b>

Source: Ontario Colleges website



### Emerging Workforce Multimodal Transportation and Logistics - Number of Enrollments by Program

Total Number of degree seeking students (headcount) enrolled for Fall 2008 (except where stated), including domestic and international students.	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Business & Commerce	1,377	2,184	8,479	8,591	712	21,343
Computer Science	687	179	1,070	588	101	2,625
Mathematics	67	237	1,892	111	62	2,369
<b>TOTAL LOGISTICS</b>	<b>2,131</b>	<b>2,600</b>	<b>11,441</b>	<b>9,290</b>	<b>875</b>	<b>26,337</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of masters degree seeking students (headcount) enrolled for Fall 2008 (except where stated), including domestic and international students.	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Business & Commerce	11	0	1,346	138	0	1,495
Computer Science	40	0	84	66	0	190
Mathematics	8	0	102	22	0	132
<b>TOTAL LOGISTICS</b>	<b>59</b>	<b>0</b>	<b>1,532</b>	<b>226</b>	<b>0</b>	<b>1,817</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis



### Skilled Workforce Multimodal Transportation and Logistics Number of Graduates by Program

Number of degrees conferred 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Business & Commerce	220	502	1,954	1,553	158	4,387
Computer Science	84	35	222	80	22	443
Mathematics	18	20	284	11	11	344
<b>TOTAL LOGISTICS</b>	<b>322</b>	<b>557</b>	<b>2,460</b>	<b>1,644</b>	<b>191</b>	<b>5,174</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of masters graduate degrees conferred 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Business & Commerce	1	0	567	86	0	654
Computer Science	11	0	40	17	0	68
Mathematics	2	0	85	10	0	97
<b>TOTAL LOGISTICS</b>	<b>14</b>	<b>0</b>	<b>692</b>	<b>113</b>	<b>0</b>	<b>819</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis



<b>2011-2012</b>				
<b>Community College</b>	<b>Logistics</b>			
	<b>Logistics Supply Chain</b>	<b>Computer Science</b>	<b>Business Management</b>	<b>Total all Colleges</b>
<b>Durham</b>	<b>0</b>	<b>28</b>	<b>111</b>	<b>139</b>
<b>George Brown</b>	<b>0</b>	<b>77</b>	<b>214</b>	<b>291</b>
<b>Centennial</b>	<b>10</b>	<b>355</b>	<b>479</b>	<b>844</b>
<b>Seneca</b>	<b>87</b>	<b>340</b>	<b>526</b>	<b>953</b>
<b>Fleming</b>	<b>0</b>	<b>46</b>	<b>136</b>	<b>182</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>97</b>	<b>846</b>	<b>1,466</b>	<b>2,409</b>

Source: College KPI data



## Information Technology

### ICT Sector - Number of Post-Secondary Programs

Number of Graduate and Undergraduate Programs				
Institution	Information Technology	Math	Business	TOTAL
<b>UOIT</b>				
Bachelor	7	1	0	8
Masters	3	0	1	4
Doctorate	3	0	0	3
Others (Diploma/Cert etc.)	0	0	0	0
<b>TOTAL</b>	<b>13</b>	<b>1</b>	<b>1</b>	<b>15</b>
<b>Toronto - Scarborough Campus</b>				
Bachelor	0	0	0	0
Masters	0	0	0	0
Doctorate	0	0	0	0
Others (Diploma/Cert etc.)	0	0	0	0
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Toronto</b>				
Bachelor	8	13	7	28
Masters	4	2	1	7
Doctorate	1	2	1	4
Others (Diploma/Cert etc.)	0	0	1	1
<b>TOTAL</b>	<b>13</b>	<b>17</b>	<b>10</b>	<b>40</b>
<b>Ontario College of Art &amp; Design</b>				



Bachelor	0	0	0	0
Masters	0	0	0	0
Doctorate	0	0	0	0
Others (Diploma/Cert etc.)	0	0	0	0
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Ryerson</b>				
Bachelor	3	0	3	6
Masters	5	1	1	7
Doctorate	2	0	0	2
Others (Diploma/Cert etc.)	6	0	2	8
<b>TOTAL</b>	<b>16</b>	<b>1</b>	<b>6</b>	<b>23</b>
<b>Trent</b>				
Bachelor	5	4	1	10
Masters	0	0	0	0
Doctorate	0	0	0	0
Others (Diploma/Cert etc.)	0	0	0	0
<b>TOTAL</b>	<b>5</b>	<b>4</b>	<b>1</b>	<b>10</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>47</b>	<b>23</b>	<b>18</b>	<b>88</b>

Source: Association of Universities and Colleges of Canada

Number of Programs			
Institution	ICT		
	Information Technology	Business	TOTAL
<b>DURHAM</b>			
CERTIFICATE	0	1	1
DIPLOMA	4	1	5



ADVANCED DIPLOMA	1	1	2
DEGREE - BACHELOR'S	0	0	0
GRADUATE CERTIFICATE	1	1	2
<b>TOTAL</b>	<b>6</b>	<b>4</b>	<b>10</b>
<b>George Brown</b>			
CERTIFICATE	0	1	1
DIPLOMA	1	1	2
ADVANCED DIPLOMA	2	4	6
DEGREE - BACHELOR'S	0	0	0
GRADUATE CERTIFICATE	2	2	4
<b>TOTAL</b>	<b>5</b>	<b>8</b>	<b>13</b>
<b>Centennial</b>			
CERTIFICATE	1	0	1
DIPLOMA	4	3	7
ADVANCED DIPLOMA	11	3	14
DEGREE - BACHELOR'S	0	0	0
GRADUATE CERTIFICATE	0	5	5
<b>TOTAL</b>	<b>16</b>	<b>11</b>	<b>27</b>
<b>Seneca</b>			
CERTIFICATE	0	1	1
DIPLOMA	7	3	10
ADVANCED DIPLOMA	3	4	7
DEGREE - BACHELOR'S	0	0	0
GRADUATE CERTIFICATE	4	1	5
<b>TOTAL</b>	<b>14</b>	<b>9</b>	<b>23</b>
<b>FLEMING</b>			
CERTIFICATE	0	0	0



DIPLOMA	1	1	2
ADVANCED DIPLOMA	2	2	4
DEGREE - BACHELOR'S	0	0	0
GRADUATE CERTIFICATE	4	1	5
<b>TOTAL</b>	<b>7</b>	<b>4</b>	<b>11</b>

<b>TOTAL ALL INSTITUTIONS</b>	<b>48</b>	<b>36</b>	<b>84</b>
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Source: Ontario Colleges website





### Emerging Workforce ICT - Number of Enrollments by Program

Total Number of degree seeking students (headcount) enrolled for Fall 2011 (except where stated), including domestic and international students.	Full/Part Time					Total all Universities
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Business & Commerce	1,377	2,184	8,479	8,591	712	21,343
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Mathematics	67	237	1,892	111	62	2,369
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Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of masters degree seeking students (headcount) enrolled for Fall 2011 (except where stated), including domestic and international students.	Full/Part Time					Total all Universities
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Business & Commerce	11	0	1,346	138	0	1,495
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Mathematics	8	0	102	22	0	132
<b>Total Information Technology</b>	<b>59</b>	<b>0</b>	<b>1,532</b>	<b>226</b>	<b>0</b>	<b>1,817</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis



### Skilled Workforce - ICT Number of Graduates by Program

Number of degrees conferred 2011	Full/Part Time					Total all Universities
	UOIT	University of Toronto Scarborough	University of Toronto	Ryerson	Trent	
Business & Commerce	220	502	1,954	1,553	158	4,387
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Source: Common University Data Extracted from University Offices of Institutional Research and Analysis

Number of masters graduate degrees conferred 2011	Full/Part Time					Total all Universities
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Business & Commerce	1	0	567	86	0	<b>654</b>
Computer Science	11	0	40	17	0	<b>68</b>
Mathematics	2	0	85	10	0	<b>97</b>
<b>Total Information Technology</b>	<b>14</b>	<b>0</b>	<b>692</b>	<b>113</b>	<b>0</b>	<b>819</b>

Source: Common University Data Extracted from University Offices of Institutional Research and Analysis



<b>2011-2012</b>			
<b>Community College</b>	<b>ICT</b>		
	<b>Information Technology</b>	<b>Business Management</b>	<b>Total</b>
<b>Durham</b>	<b>28</b>	<b>111</b>	<b>139</b>
<b>George Brown</b>	<b>77</b>	<b>214</b>	<b>291</b>
<b>Centennial</b>	<b>355</b>	<b>479</b>	<b>834</b>
<b>Seneca</b>	<b>357</b>	<b>526</b>	<b>883</b>
<b>Fleming</b>	<b>46</b>	<b>136</b>	<b>182</b>
<b>TOTAL ALL INSTITUTIONS</b>	<b>863</b>	<b>1,466</b>	<b>2,329</b>

Source: College KPI data



## Appendix IV: List of Stakeholders Consulted

Jenn Atkinson	5 Minds Mobility
Anil Bhalla	Aditya Birla Minacs Worldwide Ltd
Kirsten Burgomaster	Lakeridge Health
Darrin Caron	Durham College, School of Skilled Trades, Apprenticeship & Renewable Technology (START)
Dennis Croft	Spark Centre
Jason Easton	General Motors
Jason Field	Life Sciences Ontario
Linda Greico	P.R. Engineering Limited
Jed Henley	Ministry of Economic Development, Trade, and Employment (MEDTE)
Roland Kielbasiewicz	Innovative Solutions Inc.
John Lupton	GeoSight CMS
Tom McHugh	RS McLaughlin Durham Regional Cancer Centre
Heather McMillan	Durham Workforce Authority
Brett Murphy	Lakeridge Health, Lakeridge Health Education and Research network (LHEARN)
Greg Murphy	Durham College, School of Media, Art, and Design (MAD)
Martin Nowak	The Durham Strategic Energy Alliance
Ron Obeth	Organization of Canadian Nuclear Industries
Pamela Ritchie	UOIT, Faculty of Business and Information Technology
Kathy Weiss	Regional Municipality of Durham
Steve Wilcox	Oshawa Municipal Airport