







ADEQUACY DIAGNOSIS LIFE SCI TRAINING - SKILLS - HEALTH EMPLOYMENT SECTOR

LIFE SCIENCES AND HEALTH TECHNOLOGIES SECTOR

Votre coment

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PRESIDENT'S MESSAGE CONSEIL EMPLOI

The job market is continually transforming, but today, it is undergoing additional pressures from the leveraging effects of the aging population, technological changes and the energy transition that are exacerbating the issues, preventing it from functioning optimally. In this context, the Conseil emploi metropole (CEM) is responsible for supporting the economic stakeholders in addressing the challenge and enabling them to adapt more easily to these changes.

METROPOLE

In line with the job market and the other business areas, the life sciences and health technologies (LSHT) industry is currently experiencing a significant technological shift that will sustainably transform the nature of the jobs being held. Over the next few years, this shift will affect the entire value chain of the sector associated with therapeutic innovations and high value-added diagnostics.

Both in terms of research and development activities as the conduct of clinical trials and the commercialization of therapeutic innovations, technological changes will increase the efficiency of certain tasks performed by professionals, transform the nature of some and render others obsolete. Faced with these changes, the specific scope and nature of the impact of these disruptive technologies nevertheless remain to be defined.

It is precisely in an effort to address these issues that the CEM supported the preparation of this report by Montréal InVivo, the LSHT cluster of the Greater Montreal. This diagnostic sheds valuable light on the factors

that influence the transformation in the LSHT sector, the different types of skill that tomorrow's professionals should have and the challenges that this will represent for educational institutions in terms of adapting the education offered to promote a better match between training and jobs.

Implementing areas for reflection aiming to ensure the development of a competent work force with respect to future industry needs will call for increased collaboration between companies, institutions, the education community and government partners, and the CEM intends to support dissemination and ensure the impact of these recommendations among key players in the job market.

We would like to thank all the collaborators and contributors who participated in this prospective approach to painting a portrait of the LSHT industry. Without their valuable contribution, this report would not have been as complete.

Audrey Murray

President of the Conseil emploi metropole



CHIEF EXECUTIVE OFFICER'S MESSAGE MONTRÉAL INVIVO

The life sciences and health technologies (LSHT) ecosystem of Greater Montreal is a strategic sector identified by the different levels of government as being a priority for Québec's economic prosperity.

This complex ecosystem has developed into a concentration of niches of excellence that act as vectors of innovation and in which scientific and industrial partnerships are flourishing. It acts as a talent incubator bringing together on its territory a critical mass of entrepreneurs, researchers and investors who are bringing forth the diagnostic and therapeutic innovations of tomorrow. The rapid expansion of health technologies, precision medicine and genomics plays a certain role, just like the excellence of the teaching provided here by the world-class universities, the faculties of medicine and pharmacy, the engineering schools, the teaching hospitals and the specialized colleges.

Unquestionably, our ecosystem's public and private stakeholders recognize that the quality of our talent pool is a gauge of economic success and is among the main growth factors of LSHT organizations. However, in terms of relative scale, our talent pool competes less easily with the other North American LSHT hubs. This situation is worrisome because a talent pool that is large enough, rich and diversified is essential to ensure our sector lasts and remains competitive over the long term. On top of that are the accelerating technological and demographic changes that are cause for concern for companies in several sectors that are already struggling to identify the next generation of leaders they need for the future of their operations.

In its unifying role that provides a meeting point for the decision-makers of companies, institutions and public and private research organizations, Montréal InVivo has decided to proactively address this issue by identifying "improved competitiveness in the LSHT talent pool" as one of its four strategic priorities. This adequacy diagnosis will be used as a trigger for several concerted actions to ensure that the job market has a sufficient supply of qualified talent in LSHT for years to come.

Frank Béraud

Chied Executive Officer of Montréal InVivo



MANAGING DIRECTOR'S MESSAGE PHARMABIO DÉVELOPPEMENT

It is with great pleasure and appreciation that Pharmabio Développement has agreed to collaborate in the work that has led to this diagnostic that aims to match training, skills and jobs for the life sciences and health technologies sector.

Over the years, Pharmabio Développement has been constantly seeking to improve the human resources management practices used in the industrial sector of pharmaceutical and biotechnological production. Today, the sector's needs are numerous, more complex and more significant than ever. One fact, however, remains unchanged: ongoing training continues to be an essential pillar in the smooth operation of our industry.

The information contained in this diagnostic is crucial: it will allow us to better understand the trends and movements, as well as the key skills that the next generation of leaders must have. One thing we can't ignore: we must ramp up this transformation sooner rather than later. This exercise will enable us to offer products and services that are more consistent with industry expectations and align our efforts with those of our industry partners and teaching institutions that are working together with us to ensure that the next generation meeting the constantly changing needs of our companies. The arrival of this diagnostic will help us to support and advise our partners in industry and in education in developing solutions to the current labour shortage problems. Regarding our workforce sectoral committee, whose mission is to promote all the partnership and cooperation initiatives stimulating the development of skills of the industry's workforce, it went without saying that our participation in such an approach was part of our cooperation and mobilization activities of the different industry stakeholders aimed at improving and maintaining the skills of workers in the industry.

The diagnostic reminds us of the extent to which we are privileged to work in a growing sector in which innovation and talent are central to our success! The next few years will be filled with exciting challenges that will beckon us to address the ongoing and changing needs of an evolving sector. It also offers us the possibility of expecting these changes and takes strategic actions that are conducive to this evolution, so that our companies remain competitive, forward-looking, productive and innovative in their expertise.

Kim Bourgeois

Managing Director of Pharmabio Développement



DIAGNOSTIC OBJECTIVES

As part of a joint initiative to ensure the sustainability and competitiveness of the LSHT sector's talent pool of the Montreal census metropolitan area (CMA), Pharmabio Développement and the Conseil emploi metropole (CEM) have undertaken to update two documents produced by the CEM in 2013 on the training-employment adequacy and the needs to the talent sector¹.

The economic portrait taken in this document, as well as the documentation on the existing skills gaps between the education delivered in higher education institutions and the job market needs, will be used to establish a concerted strategy for the development of LSHT talent and skills. This strategy will then allow the LSHT sector to ensure that its talent pool can meet current and future needs of the companies that make it up, in particular in terms of entrepreneurship. This report has four objectives:

- » Present the current portrait of LSHT in Québec
- » Analyze the cross-cutting trends in LSHT and those specific to the subsectors that will have an impact on the skills required in the main classes of the sector's professions in the future
- » Take an inventory of the current college, university and ongoing training programs offered, and analyze the gaps between the content of the educational programs and the skills required in the future
- » Make recommendations regarding future educational methods and content based on different adaptation scenarios

The analytical framework adopted to achieve the objectives is based on exhaustive research and consultations carried out with representative stakeholders from the sector. A review of the studies carried out on the topic, processing of the data from recognized government agencies, as well as interviews and consultations with industry experts and decision-makers fueled the various analyses.

Offre de formation et adéquation formation-emploi, secteur des sciences de la vie et Diagnostic des besoins en main-d'œuvre : contexte, enjeux et défis pour le secteur des sciences de la vie. CEM. 2013.

DIAGNOSTIC PRESENTATION

This document is divided into the following six sections:

- » The portrait of the LSHT sector
- » The main classes of professions and job titles
- » Talent and skill needs
- » The talent pool and education offered
- » Training-skills-employment adequacy
- » Recommendations to implement to promote this adequacy

» PORTRAIT OF THE SECTOR

The first section opens with a definition of the LSHT sector and then paints its economic portrait. It provides an overview of the development of the sector, of its vitality and of its contribution to the Québec economy. The portrait positions LSHTs and the economic weight of the industry among Québec's major economic sectors.

THE MAIN CLASSES OF PROFESSIONS AND JOB TITLES

The section on the main classes of professions and job titles details the 29 classes of professions from the National Occupational Classification (NOC) found in the LSHT sector, as well as the 26 most important job titles of which they are made up. This section is divided into two subsections, i.e. a general portrait of 15 job titles, and a detailed portrait of 11 other names identified as jobs "of the future" in interviews carried out with companies in the sector. The analysis of the main classes of professions and job titles includes a definition that makes up the bulk of the LSHT talent pool, and an analysis of the different data available. The subsection provides information on the number of employees, education received, etc. The detailed portrait of the jobs of the future proposes an extensive analysis of the skills sought for each of these 11 job titles.



» TALENT AND SKILL NEEDS

The analysis of the talent and skill needs sheds light on the existing or future gaps in companies. These gaps may be quantitative in nature – the need for a greater number of professionals – or qualitative in nature – the evolving needs in terms of the knowledge and skills required to function in the industry.

THE TALENT POOL AND EDUCATION PROVIDED

The following section lists the pre-service and ongoing training programs, whether they are proposed by teaching institutions or through the support organizations (for example: Pharmabio Développement, Conseil de formation pharmaceutique continue, professional orders, etc.)

THE TRAINING-SKILLS-EMPLOYMENT ADEQUACY

The second-last section focuses on the training-skillsemployment adequacy. In the first part of the section, a quantitative analysis of the employment opportunities and of the development of the pool of students from the most important classes of professions in the industry is carried out using the CEM's training-employment adequacy model. The modelling sheds light on the classes of professions for which the shortages or surpluses of graduates are expected. The section ends with the presentation of the main findings on the adequacy between the skills sought by the industry and the skills taught in pre-service programs.

» CONCLUSION AND RECOMMENDATIONS

In conclusion, recommendations are issued to balance the educational programs provided with market needs. Appendix 1 presents the sector definition as well as the methodology used to limit its use to companies carrying on real activities in the LSHT sector. Appendix 2 includes examples of companies for each of the LSHT subsectors. Appendix 3 presents different descriptive statistics on the LSHT training offered. Appendix 4 groups together the diagrams presenting the qualitative matching by job title. Finally, Appendix 5 describes the methodology used and the data collection conducted.



SUMMARY

LSHT, a dynamic sector with a favourable outlook

The Montreal life sciences and health technologies (LSHT) sector figures prominently in Québec's economy and commands a leading position in Canada. A true ecosystem that is constantly evolving, the sector groups together a set of institutions, public organizations (teaching hospitals, universities, technology transfer centres, etc.), companies and specialized suppliers divided into seven (7) subsectors:

- » Innovative pharmaceuticals
- » Medical technologies
- » Biotechnologies
- Health and artificial intelligence information technologies (Health/AI IT)
- » Contract research organizations (CRO)
- » Contract manufacturing organizations (CMO)
- » Natural health products

Together, the different stakeholders of this impressive ecosystem cover the full value chain associated with the high value-added therapeutic and diagnostic innovations, fundamental research to the commercialization of services, and innovative products. Demographic trends and the growth of sales and venture capital investments are all signs that the sector shows very favourable development and growth prospects for the next few years. The new technologies create new possibilities that still remain untapped in several LSHT subsectors such as medical technologies, biotechnologies and health /AI IT.

The ecosystem relies on a talent pool and recognized expertise. In addition to leading scientific expertise, the Montreal LSHT ecosystem has many assets, including the proximity of all the stakeholders, integration of the subsectors, recognized expertise in AI, and a group of dynamic small and medium-sized enterprises (SMEs). Because of the sector's favourable outlook, the many technological changes and retirements, the industry anticipates significant needs in terms of talent and specialized skills.



Definition of the subsectors that comprise the LSHT sector

Subsectors		Description
Innovative Pharmaceuticals	Ä	Innovative pharmaceutical companies intervene on the entire value chain. As such, they operate in different types of activities such as foundational research, product development, clinical research, molecule synthesis, the manufacturing and marketing of prescription and over-the-counter medications.
Contract Manufacturing Organizations	\bigcirc	Contract Manufacturing Organizations (CMO) are companies that develop, manufacture and market genetic versions of drugs whose patents have expired or non-patented drugs. Contract Manufacturing Organizations provide production services for pharmaceutical products or natural health products on a commercial scale.
Contract Research Organizations		Contract Research Organizations (CRO) provide preclinical and specialized clinical research services. These services are related to the development of new therapeutic products, in vitro studies to advanced-phase clinical studies.
Medical Technologies	R	The main activities of companies operating in the medical technology subsector are the design, development, manufacturing and commercialization of medical equipment. This subsector combines all articles, instruments and devices, manufactured or sold to be used in diagnosing, treating, mitigating or preventing, in human beings, diseases, disorders, physical states or their symptoms. It can also be used in the rehabilitation, correction or modification of a human being's organic function or bodily structure.
Health/Al IT	N	Health/AI IT companies focus on improving interactions between stakeholders and the industry, particularly through technological tools. Whether it involves exchanges between patients and health care providers or even between industry players, the tools developed improve the transmission and accuracy of information, as well as patients' experience with health services. The IT Health and AI sector involves multiple sources of massive biological data, whether it is in bioinformatics, the development of AI medical applications or for the development of connected health care devices. Basically, whether they are in medical technologies, IT health or AI, companies design, develop, manufacture or market physical or digital medical products, other than drugs. These products are used for preventive, diagnostic and therapeutic purposes or for the provision of health services.
Biotechnology	Pallpa	Biotechnology companies devote a major part of their expenses to R&D activities of therapeutic products, platforms or procedures involving living organisms, typically micro-organisms, vegetation or their extracts, and oversee the development or the management of the intellectual property associated with the resulting innovations.
Natural Health Products	Ø	NHP companies design, manufacture, distribute and market products derived from natural sources and can be sold in different dosage forms. NHPs group together, in particular, but not limited to, traditional remedies, vitamins and minerals, probiotics as well as other products such as amino acids and essential fatty acids. Natural health products must be approved by Health Canada.

Distribution of jobs in the LSHT sector



LSHT sector fields of expertise and niches of excellence



For Health/AI IT, data is from 2014.

Sources: KPMG-SECOR, 2015; Montréal InVivo, 2017; Analyse Avideo Conseil, 2018.

Source: 2017-2027 Québec Life Sciences Strategy

Disruptive technologies will continue to transform the value chain and the patient's course.

A changing sector and an indemand talent pool

Disruptive technologies will continue to transform the value chain and the patient's course. In fact, the breakthroughs in genomics, the multiplication of connected objects, the use of many sources of massive biological data and the contribution of AI in medical diagnostic support should continue to transform research and development (R&D) activities, the conduct of clinical trials, and the commercialization of the resulting high value-added therapeutic and diagnostic innovations. Ultimately, this could lead to a democratization of access to personalized health care and to precision medicine, thereby fundamentally altering our relationship to health and to disease, as much in aspects of prevention as treatment. Nevertheless, many uncertainties remain regarding the exact form this transformation will take. Both public decisionmakers and industry leaders are still unfamiliar with the transformational impact that all this will have, in particular regarding the development of AI, the scope of these ramifications and its virtually irreversible implementation in the activities of the entire LSHT sector.

Furthermore, disruptive technologies raise many issues, among others, safety, ethics and reliability, because the existing regulatory and legislative frameworks have not yet been adapted to these new possibilities. If the fears of abuses are legitimate, the absence of regulatory adjustments limits, at this time, the potential benefits of their uses in research, in particular for clinical trials. The implementation of new technologies will depend on the regulatory authorities that will have to find a balance between protecting the public and supporting innovation.

The integration of new technologies will undeniably result in the additional needs in terms of training and skills, which will vary based on the type of user. However, as Al will take over in carrying out the processes, it could decrease the need for medium-term technological skills. Minimally, all future users should be made aware to facilitate the adoption of these technologies.

A sector that will benefit from a better training-employment adeqaucy

Based on the results of the metropolitan monitoring tool of the Conseil emploi metropole (CEM), there exists a sufficient number of graduates for most classes of scientific professions (chemistry, biology, engineering, technicians, etc.) in LSHT. However, job market conditions differ from one class to another and may prove difficult despite an observed balance. Placing certain graduates is more difficult than for others. The level of experience sought by employers can also be unfavourable for certain young graduates. The few technical programs in animal health and biomedical analyses, that show a deficit in the number of graduates, would be sufficient to fill the needs expressed by the sector if a greater number of them went into LSHT. Unfortunately, the LSHT sector still suffers from a negative reputation with a number of students.



There is a widespread shortage of technology-based occupational classes in LSHT. Companies in the industry are having a very difficult time recruiting and retaining professionals in IT health, data sciences and AI, regardless of their level of experience. The shortage will be even more acute in LSHT than in other lines of business1. The technological skills mismatch is also widespread over a large part of the talent pool. The shortage of talent in Health/AI IT particularly affects the sector's SMEs. In fact, the presence of large companies and subsidiaries of foreign companies even further complexifies the issues of attracting and retaining talent with which it is faced. In some cases, SMEs must also deal with salary inflation, in addition to filling the significant needs of in-house training.

A sector that prioritizes cross-cutting skills and hybrid profiles

LSHT companies are looking for professionals with highly developed specific and cross-cutting skills. However, some of these skills are acquired through professional experience in the field of activity concerned and cannot all be mastered upon graduation. Companies therefore turn to seasoned professionals who are proficient in the sought-after skills, thereby neglecting new graduates.

Regulatory and business intelligence competencies are poorly covered by current LSHT academic programs and are generally acquired on the job with experience. However, the needs in the area are significant and affect all of the sector's classes of professions. This knowledge proves difficult to introduce in the curriculae of teaching institutions, which are very unfamiliar with them. In addition, economic and technological trends constantly require better proficiency of entrepreneurial skills or that new management methods be learned.

Associated with that, the continued growth of skills required in IT require that the majority of new

1) Diagnostic intersectoriel sur l'adéquation formation-compétences-emploi : Professions en technologies de l'information et des communications, CEM, TECHNOCompétences et TechnoMontréal, 2018. professionals in the industry possess high-level scientific knowledge, master to a large extent the specifics of the companies to which they are applying, while having an adequate technological background. Today, IT skills are essential for applying scientific knowledge, and this is why technological advances make hybrid profiles so attractive.

In return, the hyper-specialization among graduates presents many challenges, particularly the difficulty in placing individuals who hold a Ph.D. or who are overqualified with certain university degrees in technical positions. In these specific cases, the industry must reconsider its role in integrating new graduates in the job market and challenge the need to have such extensive specific knowledge and skills. Special focus should also be placed on the motivations that drive students to continue their studies to very advanced levels: do they do this for lack of having a clear idea of the opportunities created by their current diplomas, or in order to increase their employability? In both cases, reflection is needed.

> It is in the LSHT sector that the widespread shortage of IT, data science and Al professionals is the most striking.



Distribution of job names by profession class

Job name	Profession class (NOC)				
Analytical chemist	2112	Chemists			
Formulation chemist (process and medicinal)	2112	Chemists			
Biochemist and clinical biochemist	2112	Chemists			
Bioinformatician and computational biologist	2121	Biologists and related scientists			
Molecular biologist	2121	Biologists and related scientists			
Microbiologist	2121	Biologists and related scientists			
Dismodial agricos	2132	Mechanical engineer			
Biomedical engineer	2133	Electrical and electronics engineers			
Chemical and bioprocess engineer	2134	Chemical engineers			
Biostatistician	2161	Mathematicians, statisticians and actuaries			
Data scientist	2172	Database analysts and data administrators			
	2147	Computer engineers (except software engineers and designers)			
	2171	Information systems analysts and consultants			
Health/Al IT professionals	2173	Software engineers and designers			
	2175	Web designers and developers			
	2174	Computer programmers and interactive media developers			
	2112	Chemists			
Assurance and quality control	2121	Biologists and related scientists			
specialist	2211	Chemical technologists and technicians			
	2221	Biological technologists and technicians			
	2211	Chemical technologists and technicians			
Laboratory and manufacturing	2221	Biological technologists and technicians			
technician	3211	Medical laboratory technologists			
	3212	Medical laboratory technicians and pathologists' assistants			



Distribution of job names by profession class

Job name	Profession class (NOC)				
	2232	Mechanical engineering technologists and technicians			
Technologist, plant operator, engineering technician	2233	Industrial engineering and manufacturing technologists and technicians			
	9421	Chemical plant machine operators			
	2121	Biologists and related scientists			
Pharmacologist	3112	General practitioners and family physicians			
	3131	Pharmacists			
	2121	Biologists and related scientists			
Medical science liaison	3111	Specialist physicians			
officer	3112	General practitioners and family physicians			
	3131	Pharmacists			
	2121	Biologists and related scientists			
	3111	Specialist physicians			
Scientific and medical advisor	3112	General practitioners and family physicians			
	3131	Pharmacists			
Veterinary doctor	3114	Veterinarian			
Industrial Pharmacist	3131	Pharmacists			
Animal health technician	3213	Animal health technologists and veterinary technicians			
Patent agent	4161	Natural and applied science policy researchers, consultants and program officers			
Regulatory affairs	4161	Natural and applied science policy researchers, consultants and program officers			
specialist	4165	Health policy researchers, consultants and program officers			
Pharmacoeconomist	4162	Economists and economic policy researchers and analysts			
Clinical research associate	4165	Health policy researchers, consultants and program officers			
Scientific editor	5122	Editors			
Sales representative or sales manager	6221	Technical sales specialists - wholesale trade			



Number of jobs in LSHT for each profession class

Profession class (NOC)		All industries combined	ries LSHT - All of Ouebec		LSHT - CMA Montreal	
Chemists	2112	3, 500	809	23 %	651	19 %
Biologists and related scientists	2121	4, 615	555	12 %	405	9 %
Mechanical engineers	2132	12, 410	193	2 %	122	1 %
Electrical and electronics engineers	2133	9, 175	192	2 %	142	2 %
Chemical engineers	2134	1, 865	141	8 %	95	5 %
Computer engineers (except software engineers and designers)	2147	6, 590	281	4 %	219	3 %
Mathematicians, statisticians and actuaries	2161	3, 760	31	1 %	18	0 %
Information systems analysts and consultants	2171	30, 790	1 017	3 %	751	2 %
Database analysts and data administrators	2172	4, 940	156	3 %	122	2 %
Software engineers and designers	2173	7, 035	362	5 %	295	4 %
Computer programmers and interactive media developers	2174	29, 350	1 337	5 %	963	3 %
Web designers and developers	2175	6, 535	252	4 %	193	3 %
Chemical technologists and technicians	2211	5, 800	1 267	22 %	977	17 %
Biological technologists and technicians	2221	2,400	243	10 %	119	5 %
Mechanical engineering technologists and technicians	2232	5, 920	76	1 %	45	1 %
Industrial engineering and manufacturing technologists and technicians	2233	4, 225	153	4 %	89	2 %
Specialist physicians	3111	10,955	58	1 %	46	0 %
General practitioners and family physicians	3112	12, 685	16	0 %	6	0 %
Veterinarians	3114	2,270	9	0 %	6	0 %
Pharmacists	3131	8, 780	86	1 %	73	1 %
Medical laboratory technologists	3211	4, 255	275	6 %	208	5 %
Medical laboratory technicians and pathologists' assistants	3212	4, 545	562	12 %	278	6 %
Animal health technologists and veterinary technicians	3213	3, 325	91	3 %	70	2 %
Natural and applied science policy researchers, consultants and program officers	4161	5 ,575	208	4 %	123	2 %
Economists and economic policy researchers and analysts	4162	4,060	37	1 %	30	1 %
Health policy researchers, consultants and program officers	4165	5, 960	492	8 %	421	7 %
Editors	5122	4, 460	30	1 %	24	1%
Technical sales specialists - wholesale trade	6221	13, 350	983	7 %	657	5 %
Chemical plant machine operators	9421	3, 615	1 188	33 %	858	24 %
TOTAL		222, 745	11, 101	5 %	8, 003	4 %

TRAINING-EMPLOYMENT ADEQUACY

The purpose of this section is to assess whether the training offered in Greater Montreal corresponds quantitatively to the needs of the job market. Through the results of the CEM's metropolitan monitoring tool used to assess the education-employment match, different observations related to the classes of professions and job names in the LSHT sector were made.

Presentation of the metropolitan monitoring tool on the trainingemployment adequacy

The alignment between the education provided and the needs of the job market is taking an increasing large place in how Québec is planning its educational programs. The new management framework of the Ministry of Education and Higher Education of the vocational and technical training offer and the consultation of the prioritization of the needs of the job market, piloted by the Commission des partenaires du marché du travail, are fine examples.

In this context, the CEM has developed an trainingemployment adequacy model that is representative of the job market in the city. This tool allows changes in the job market to be monitored, reasons for a mismatch to be proposed and certain actions to be prioritized. It also allows recommendations to be made regarding prioritization of educational needs. As such, it indicates for each class of professions and targeted job title, if there is a deficit, a balance or a surplus of graduates, to better orient those starting out in this sector. The Ministry of Education and Higher Education's trainingemployment adequacy model is a quantitative model designed to establish the order of magnitude of the talent needs from the education network for all of Québec. Ultimately, allows for the following question to be answered for each of the educational programs: how many beginners are required in a program to meet the needs of the job market in terms of new workers? The diagnostic therefore focuses on the technical and university curricula in LSHT.

The metropolitan monitoring tool uses the talent demand rate provided by Emploi-Québec to determine the number of job vacancies for each class of profession and job title in line with the programs of study considered and calculate the number of graduates from a program or a discipline needed to fill this need. The number of beginners required to then be estimated, by adjusting the number of graduates targeted based on the school retention rate and on the graduation rate per program.

This model meets the Ministry of Education and Higher Education's national planning needs and is based on the data gathered in Québec as a whole. The regionalization is prorated based on the number of jobs included in the program of study observed in each region, and not based on regional characteristics.

For the Montreal CMA, factors such as the contribution of immigration to the job market, the importance of AEC (Attestation d'études collégiales) college training programs and university

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training programs are indispensable, not to mention that the growth of the industrial sectors differs from one region to another. Furthermore, the Ministry of Education and Higher Education model does not distinguish between the economic sectors in which graduates find a job.

Monitoring tool results

The metropolitan monitoring tool is an training-employment adequacy model that relies on the NOC, and that assesses whether the number of graduates heading into the LSHT sector is adequate to meet the needs of companies in the sector for workers with less than three years of experience. It then assesses whether the number of students entering these associated educational programs is sufficient to meet graduate demand.

The results of the model are an essential component of the matching between talent supply and demand, because they allow existing deficits or surpluses of students to be detected and future deficits or surpluses to be anticipated.

The results of the metropolitan monitoring tool for each of the classes of targeted professions are presented in the following table. These results show that the majority of the classes of science-related professions are balanced, that is, that the number of graduates from the educational programs should be sufficient to fill the needs of companies in the sector.

The results of the model allow some additional observations to be made and several issues raised by the industry to be substantiated. The model shows in particular that the number of graduates for the classes of professions outside of the technology spectrum is not an issue. However, interviews with companies confirmed that the graduates available for a majority of science-related jobs is generally sufficient to meet the needs in terms of talent. In addition, the model and companies conclude that there is a general shortage in the technology-based classes of professions, in particular in the health/AI IT sector, and observe the difficulty in meeting the talent needs for certain technical training courses.



A sufficient number of graduates for most classes of professions

In line with the findings of the Diagnostic sectoriel des industries des produits pharmaceutiques et des biotechnologies au Québec conducted by Pharmabio Développement, the metropolitan monitoring tool allows one to conclude that there is no deficit of graduates for most classes of science-related (non-technological) professions in LSHT. The model even shows a balance between the supply and demand of graduates for the classes of professions of chemists, biologists and biologists and related scientists, and chemical, biological and medical laboratory technicians.

Pharmabio Développement's diagnostic also leads to the conclusion that there is no shortage of graduates for the positions of chemists, biologists, manufacturing technicians and quality assurance specialists¹. The diagnostic identifies, however, the recruiting difficulties for certain job titles, in particular analytical chemists, laboratory technicians, clinical research associates and process chemists².

Although the supply and demand of graduates is balanced for several classes of professions, the analysis must be completed with additional indicators from the job market, because this balance can be due to factors specific to each class of professions. In addition, the balance between the supply and demand of graduates does not mean that there is a balance between the supply and demand of experienced professionals.

1) Diagnostic sectoriel des industries des produits pharmaceutiques et des biotechnologies au Québec, Pharmabio Développement, 2018, p. 71.

2) Idem previous note





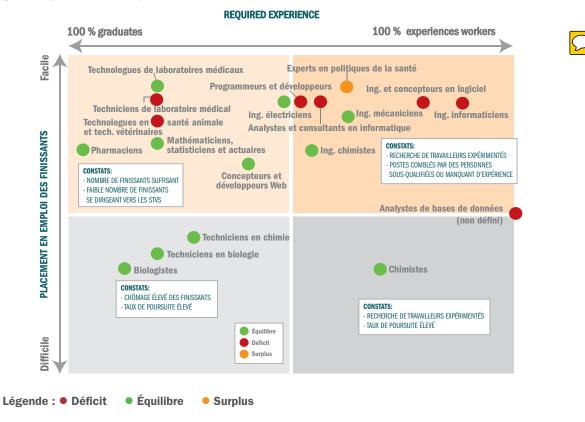
Results of the metropolitan monitoring tool analysis of the job market By class of professions

NOC	Profession	Adequacy	Unemployment rate for graduates	Employment rate for graduates	Proportion of jobs to fill by experienced employees (three years and more)
2112	Chemists	•	10-15 %	30-35 %	69,6 %
2121	Biologists and related scientists	•	10-15 %	30-35 %	12,6 %
2132	Mechanical engineers	•	Less than 5%	80 %	62,5 %
2133	Electrical and electronics engineers	•	Less than 5%	85 %	48,3 %
2134	Chemical engineers	•	Less than 5%	70 %	54,3 %
2147	Computer engineers (except software engineers and designers)	•	Less than 5%	85 %	88 %
2161	Mathematicians, statisticians and actuaries	•	Less than 5%	60-85 %	20 %
2171	Information systems analysts and consultants	•	Less than 5%	85 %	56,3 %
2172	Database analysts and data administrators	•	Unavailable	Unavailable	100 %
2173	Software engineers and designers	•	Less than 5%	85 %	79,5 %
2174	Computer programmers and interactive media developers	•	Less than 5%	85 %	53,1 %
2175	Web designers and developers	•	5-10 %	50-85 %	40,3 %
2211	Chemical technologists and technicians	•	5-15 %	30-55 %	28,2 %
2221	Biological technologists and technicians	•	5-15 %	30-45 %	20 %
3131	Pharmacists	•	Less than 5%	70 %	3,6 %
3211	Medical laboratory technologists	•	Less than 5%	90 %	20 %
3212	Medical laboratory technicians and pathologists' assistants	•	Less than 5%	90 %	20 %
3213	Animal health technologists and veterinary technicians	•	Less than 5%	80 %	20 %
4165	Health policy researchers, consultants and program officers	•	Less than 5%	90 %	62,2 %

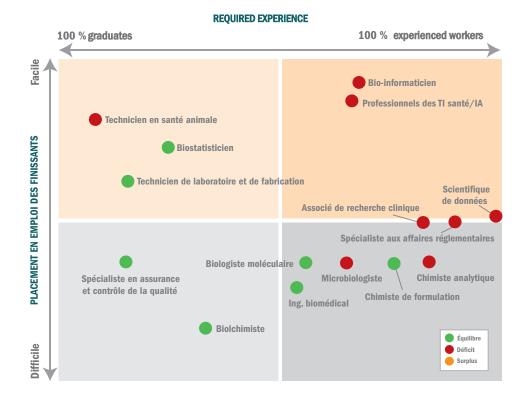
Source : MEES, 2017; Statistique Canada, 2017; CEM, 2018.



Training-employment adequacy



Adequacy and analysis of the job market by Montreal CMA job title



Sources : MEES, 2017; CEM, 2018; Analyse Aviseo Conseil, 2018.

OBSERVATIONS AND ORIENTATIONS

Observations and recommendations regarding the training-skillsemployment adequacy

The earlier sections helped to paint a complete portrait of the LSHT sector and of its associated talent pool. In fact, the portrait of the sector, an analysis of the trends, the presentation of the classes of professions and job titles, the identification of the training offered and the training-employment adequacy led to several observations related to the adequacy between the training offered and the demand for skills. The main observations and the proposed orientations to address the various needs are presented in the following summary chart.

Main observations of the diagnostic and main orientations proposed

OBSERVATION

A quality ecosystem with a limited talent pool

The ecosystem relies on a small talent pool, but on recognized

Unlike Boston or other cities, Montreal has an insufficient talent pool to be able to easily encourage major players to set up here or relocate their research centres. However, despite the small pool, all the

stakeholders met with emphasize the quality of the scientific education of the professionals educated here, as well as their leading expertise.

• The Montreal ecosystem has many assets.

8

In addition to scientists recognized for their skills, the Montreal ecosystem has many assets that deserve attention. The proximity of all the players in the ecosystem make it an environment conducive to business development and sharing knowledge. Integration of the subsectors, a complete value chain, as well as multiple connections existing between the public research centres, universities, entrepreneurship support organizations and government institutions make Montreal a veritable innovation area and allow a fluidity that facilitates development of the sector. Montreal being recognized as an Al hub should also benefit the LSHT sector. The SME ecosystem also renders the sector less vulnerable and more agile and flexible.

The industry is featured prominently and shows a positive outlook.

As shown by the sector portrait, the outlook is very favourable and the sector features prominently in the metropolitan economy, occupying a place of choice in the Canadian LSHT industry.

The sector has maintained a steady level of employment and many SMEs have been created. Over the past few years, the sector has undergone growth that is comparable to that of Québec's overall economy, and even faster growth in the subsector of medical technologies. We are also seeing a substantial increase in venture capital investments in the sector. The increased sales should continue with demographic and economic prospects tied to the aging population and subsequent health-related expenses. Business confidence is also on the rise. "In fact, whether we are talking about hiring, revenues or profitability, the pharmaceutical industry should continue to grow over the next three years¹".

The demand for labour should continue to grow.

Given the sector's favourable prospects, the many technological changes and retirements, the industry is anticipating substantial needs in terms of talent and specialized skills. In fact, pharmaceutical and biotech companies would be looking for more than 2,000 employees over the next three years. These companies nevertheless foresee hiring difficulties because more than half (54%) of them anticipate recruiting difficulties for at least one of the open positions³.

1) Diagnostic sectoriel des industries des produits pharmaceutiques et des biotechnologies au Québec, Pharmabio Développement, 2018, p. 69.

2) Diagnostic sectoriel des industries des produits pharmaceutiques et des biotechnologies au Québec, Pharmabio Développement, 2018, p. 70.

3) Idem previous footnote.

The composition of the demand for professionals varies greatly between the subsectors.

The closing of the R&D centres of the major pharmaceutical companies and their reorientation towards commercialization create substantial needs to support business development. As such, it seems that the major pharmaceuticals require more professionals with salesdriven profiles and interactions with government bodies. By doing so, regulatory affairs specialists, pharmacoeconomists and medical liaison officers are in demand, particularly in the subsidiaries of international companies.

The development of biotechnology and medical technology SMEs also generates regulatory needs. The exponential development of the growing health/AI IT subsector and the growing presence of software in medical technologies create significant needs in IT staff. The technological and scientific trends require a growing number of bioinformaticians, computational biologists, data scientists, clinical research associates, etc.

ORIENTATION #1:

Maintain the talent pool's existing level of quality, while strengthening the attractiveness of the city and of Québec in collaboration with the different relevant organizations

The Montreal LSHT ecosystem must focus on aligning the needs with the talent pool to ensure the industry's sustainability and competitiveness over the long term. Montreal must also focus on all subsectors and their integration.

Disruptive technologies will have certain effects on the demand for technological skills, but these effects still remain unknown by the industry.

Disruptive technologies should trigger a transformation of the value chain of the patient's expérience.

In fact, the breakthroughs of genomics, multiply-connected objects,

the use of multiple sources of massive biological data and the contribution of AI in helping to achieve a medical diagnosis should continue to transform R&D activities, the conduct of clinical trials, and the commercialization of the resulting therapeutic and diagnostic innovations. Ultimately, this could lead to the democratization of access to personalized health care and to precision medicine, fundamentally changing our relationship to health and disease, both in terms of prevention and treatment.

The industry is still unfamiliar with the transformational impact that artificial intelligence should have on research and operations.

Consultations have revealed that many decision-makers are unaware of the impacts of the development and use of AI in the pharmaceutical and biotechnology industry of which they will need to be made aware if they are to promote the integration of these technologies.

• Training will need to adapt to the growing needs for technology skills.

New technologies will lead to additional training needs that will vary according to the type of user. Skills and training needs will be important when it comes to integrating these new technologies, but they could decrease the need for technology skills over the medium term. Minimally, all future users will have to be aware of these technologies to facilitate their adoption. End users will gain an awareness through training that addresses notions of AI, unless all products do not include independent learning tools.

Implementation of new technologies and regulatory requirements must find a balance.

As disruptive technologies raise many security, ethical, reliability, etc. issues, regulatory requirements have not yet been adapted to these new possibilities. The regulatory authorities that must ensure public protection (e.g. data confidentiality, etc.) hesitate before approving new technologies such as learning algorithms. If concerns about drift are legitimate, the absence of adjustments to the regulatory processes nevertheless limits the potential benefits of the use of new technologies in research, particularly for clinical trials. The implementation of the new technologies will depend on the regulatory authorities, which will have to find a balance between public protection and innovation support.

ORIENTATION #2:

Develop the offer of initial training and ongoing training in information technology to ensure that it is adapted to different users and different clienteles (managers, practitioners, students, etc.)

Over the long term, the government is responsible for promoting digital literacy at the secondary school level and to giving more flexibility to teaching institutions (college program content review, ministerial reviews, cohorts, etc.) to improve talent pool skills. The government must also promote data access in order to attract LSHT researchers and develop the expertise in this sector.

OBSERVATION #3

A quantitative adequacy exists for scientific positions¹

There is a sufficient number of graduates for most LSHT-based scientific occupational classes.

In fact, according to the metropolitan monitoring tool, there is an adequate supply of graduates in chemistry,

biology, and chemical process technologies, and in certain engineering training programs. The causes of this matching, particularly the job market conditions, nevertheless differ from one occupational class to another. The demand for biologists, related scientific personnel, and chemical and biological technicians is low and graduate placement is more difficult. Chemists with more than three years of experience and boasting specific areas of expertise are the most sought-after.

R&D has a bad reputation among students in certain college training programs.

As shown in the section on the training-employment adequacy, the number of graduates from programs in animal health technology and LSHT-directed biomedical analysis techniques is too low to fill the needs of companies but would, however, be sufficient to fill the needs expressed. Interviews have revealed that students from these programs have a poor perception of the sector, and that the structure of the programs does not expose them very much to the research community, and even guides them in the direction of other practices.

ORIENTATION #3:

Pursue initiatives to promote the sector and improve the image of the LSHT sector to facilitate the attraction of talent¹⁴⁹

The LSHT sector is, despite the efforts made, still littleknown. Members of the industry would like to pursue promotional efforts, particularly among parents, educational consultants and opinion leaders with an impact on young people. According to the stakeholders met with, the diversity of the sector, the autonomy and the multitasking offered by SMEs are compelling promotional arguments to make, as well as the testimonials of members from the industry. The information available is sufficient, and companies and college- and university-level partners seem willing to help each other to disseminate this information.

OBSERVATION

There is not only a shortage of IT health/Al professionals, but also of technological skills.

There is a general shortage of IT health/Al professionals.

As shown by the results of the metropolitan monitoring tool and the consultations, there is a general shortage of IT health/Al

professionals. In fact, the companies surveyed have major problems recruiting and maintaining IT professionals in the sector, regardless of their level of experience¹. According to the most recent Diagnostic intersectoriel sur l'adéquation formationcompétences-emploi pour les professions en technologies de l'information et des communications, the shortage is more glaring in LSHT than in the other sectors of activity.

• There is a technological skills mismatch.

As the quantitative (number of professionals) and qualitative (sought-after experience) needs of companies are growing, the mismatch in terms of technological skills affects a large part of the talent pool. The technology trends and the shortage of IT professionals puts pressure on certain types of professionals to learn coding.

 Diagnostic intersectoriel sur l'adéquation formation-compétences-emploi : Profession en technologies de l'information et des communications, CEM, TECHNOCompétences et TechnoMontréal, 2018.

The shortage of talent in IT health/Al in the LSHT sector is damaging for SMEs.

The shortage of talent in IT health/AI affects in particular the SMEs in the LSHT sector. They are undergoing the increase in wages in addition to having to assume the heavy burden of inhouse training. In addition to facing issues of attracting and retaining talent, the SMEs must support the training of graduates and interns. On their part, for large companies, all sectors combined, are experiencing fewer issues in recruiting experienced workers, as revealed by the stakeholders met with.

ORIENTATION #4:

Develop concerted actions to address the shortage of professionals in IT health/AI (intersectoral summit, concerted promotional activities, joint recruitment missions, etc.)

The intersectoral diagnostic of professions in ICT recommended in particular that SMEs explore the possibility of sharing between themselves specialized IT resources and to participate in foreign talent recruitment missions.

ORIENTATION #5

The industry is seeking cross-sectoral skills and hybrid profiles.

SMEs in the LSHT sector are looking for "super professionals".

The main issue raised in the consultations is that of the hyperspecialization looked for in new professionals. Given the

high specificity of companies in the LSHT sector, and of the customized products and services offered by those companies, professionals now need to be proficient in their company's specific market segment. However, this sought-after hyper-specialization is acquired over time, through repeat experience in the business area considered, and cannot become mastered upon graduation. Since companies – particularly SMEs – do not have all the necessary resources to adequately and quickly train employees in-house, these companies turn to seasoned professionals who are already proficient in the sought-after skills and therefore neglect the new graduates.

Associated with this, the continued growth of sought-after IT skills requires most new professionals in the industry to possess high-level scientific knowledge, be proficient in the specificities of the companies to which they are applying, while having an adequate technological background.

Furthermore, it seems that the role of the industry with respect to integration of new graduates in the job market needs to be reconsidered, and we need to start reflecting on the need to be proficient in such a large volume of specific knowledge and skills.

• There is a growing demand for experienced professionals with cross-sectoral skills.

Consultations have identified certain skills that were only acquired at the end of the academic programs. Regulatory and business intelligence competencies are poorly covered by existing training programs and are generally acquired in the work environment. These programs are therefore failing the majority of LSHT graduates – with the exception of those who undergo certain internships – and are in great demand on the market. Therefore, not only are these skills not acquired in the training programs, but certain occupational classes and job titles that require a good command of these skills cannot be exercised without a minimum level of experience. As such, it has been reported that a certain number of years of experience, combined with close connections with industry players, were indispensable in obtaining certain positions including, among others, those of scientific or medical advisor, pharmaco-economist, medical science liaison officer or even clinical research associates.

The demand for experienced professionals is also seen in IT health/Al. In fact, "companies often require several years of experience and specific technical skills to fill positions in IT health/Al¹."

Regulatory knowledge needs are significant and affect all professions in the sector.

The normative and regulatory knowledge needed by many jobs in the industry remains a significant issue in the matching between initial college and university training and companies' needs. Certain stakeholders have asked that these skills be passed on by the teaching institutions, but the regulatory framework varies greatly from one subsector to another and the required knowledge, relatively unknown by the teaching community, has proven difficult to introduce in training courses.

There is a growing need for entrepreneurial and management skills.

The economic and technological trends create a greater need for entrepreneurial skills to be developed and for new management methods to be learned. In fact, the launch of many SMEs in the years that followed the major restructuring of the sector at the turning point of 2010 created a significant need for cross-sectoral management skills. The new technologies and the importance of software programs also create a need for project management skills (e.g. Agile Method, etc.).

Diagnostic intersectoriel sur l'adéquation formation-compétences-emploi : Profession en technologies de l'information et des communications, CEM, TECHNOCompétences et TechnoMontréal, 2018.

Scientists need more computer skills.

Consultations have revealed the need to develop IT skills in the talent pool. This type of skills is critical today to implement the extensive scientific knowledge, particularly that derived from "omic" tools. This is one of the reasons why certain scientists who do not have IT knowledge do not succeed in getting positions or are overqualified for those positions they do get.

Technological advances make hybrid profiles very attractive. For example, bioinformatics skills are currently highly market valued. The command of these future-oriented skills, such as specialization in biological data analysis and processing, requires a combination of biology and computer skills. Hybrid training programs (short training programs such as the D.E.S.S. or the Specialized Graduate Diploma) are also popular with companies in the industry.

Professionals in IT health/Al need more sectoral knowledge.

The stakeholders met with identified shortcomings in terms of business skills and sectoral knowledge among professionals in IT health/AI. An observation echoed in the Sectoral Diagnostic of professions in ICT, which also indicated that IT personnel should have deeper knowledge of the business areas and sectors of activity in which it works¹.

Certain graduates with an advanced scientific specialization experience job placement issues.

There are many challenges related to the hyper-specialization of graduates. Consultations have reported in particular a job placement issue with individuals with a doctoral degree (Ph.D.), and who have very advanced skills that are difficult to apply to the industry. Certain respondents pointed out the need to develop relationships between Ph.D. students and industry players to facilitate a mutual understanding of each other's realities and promote greater communication. While, according to respondents, universities train excellent scientists, many positions do not seem to call for university academics and could be filled by professionals with college-level diplomas. For example, many product-manufacturing positions could be assigned to graduates of short-term training programs, such as the AEC (Attestation of College Studies). However, the industry is reluctant to consider these graduates as potential recruits, even if they have all the sought-after qualifications. This perception deprives the industry of qualified professionals and prevents the promotion of short-term training programs that could fill the needs of many companies.

ORIENTATION # 5 :

Explore the possibility of offering mandatory courses in business intelligence and sector-based electives in IT training.

IT training programs are generalist and are built on a technological axis. According to the stakeholders met with, they could benefit from the addition of a sector-based component. For example, computer courses offered focus on certain technologies (e.g. a particular programing language, Web applications, etc.) or on certain topics (e.g. cybersecurity) and rarely focus on the practice in an industry or on the nature of an industry. Video game programing courses exist but sector-based courses are rare, if not nonexistent.

This orientation is similar to certain recommendations issued by TECHNOCompétences, the CEM and TechnoMontréal in the latest training-employment adequacy diagnostic for professions in ITC. In fact, partners recommended in particular that connections between the ITC and business functions (operations, marketing, accounting, HR, etc.) be further addressed and that opportunities for internships in non-ITC companies be promoted.

1) Diagnostic intersectoriel sur l'adéquation formation-compétences-emploi: Professions en technologies de l'information et des communications, CEM, TECHNOCompétences et TechnoMontréal, 2018.

OBSERVATION #6

Ongoing training offered in regulatory affairs and management has been developed but remains relatively unknown.

The ongoing training offered has been adjusted both for the teaching of management skills and for regulatory skills.

The ongoing training offered has nevertheless been adjusted to the entrepreneurial and management needs through

the creation of the Life Sciences

Entrepreneurship Development Program and other short programs in project management. The last sectoral diagnostic by Pharmabio Développement emphasized the fact that this organization had satisfied a part of the demand for training on regulatory obligations, in particular by developing training on best practices in manufacturing in laboratories¹.

There seems to be a demand for ongoing training while the supply is under-utilized.

Many companies encourage individual training or give training in-house. These strategies do not however seem to meet all the training needs, since 70% of pharmaceutical companies surveyed by Pharmabio Développement anticipate having training needs². However, the identification of the supply of ongoing training shows that there is an abundant supply. The training offered seems to have been adapted and developed since the diagnostic in 2013 on the training-employment adequacy and the talent needs in the LSHT sector³. However, it remains unknown,

since certain stakeholders have identified needs for already existing training. In fact, companies have expressed the idea that they lack information on existing initial training, retraining or ongoing training, and that the available training programs should be more actively publicized. The supply of technical training is under-used, while ongoing training in a research centre context could stand to be developed.

ORIENTATION #6:

Continue to promote and develop the supply of ongoing training as well as training institutes.

Companies have the responsibility to seek information about the existing training offered and to guide their employees accordingly. Ongoing training has been developed and is used to develop the double profile sought after by the industry. The investment cannot rest solely on the student. According to the experts consulted, ongoing training should, however, be accessible to those intent on joining the industry.

It is also about recommendations of the sectoral diagnostic of the pharmaceutical product industries and biotechnologies in Quebec from Pharmabio Développement.

¹⁾ Diagnostic sectoriel des industries des produits pharmaceutiques et des biotechnologies au Québec, Pharmabio Développement, 2018, p. 72.

²⁾ Idem previous note.

Offre de formation et adéquation formation-emploi, secteur des sciences de la vie et Diagnostic des besoins en main-d'œuvre : contexte, enjeux et défis pour le secteur des sciences de la vie, CEM, 2013.

OBSERVATION #7

Despite the needs for management skills, their systematic integration in the content of initial training is not necessary.

Management skills do not need to be taught to all professionals.

Despite the elements in Observation #5, the stakeholders met with recognize that management training

is an asset, but it is not necessary for all professionals. Alone, it is not enough either, because several aptitudes are acquired with experience or are passed on better by professionals than in class. Management aptitudes in LSHT are also indissociable from regulatory skills and from business intelligence.

Entrepreneurship support has improved a lot and constitutes an alternative to general management training.

The need to link academic research with the marketing of developed products or services is also one of the industry's main challenges. While entrepreneurship support organizations and initiatives are considered adequate by all the stakeholders asked – in number and quality – teaching institutions have their role to play to promote or support the efforts to market the innovations from

the academic community. The enhancement of the services offered in universities (incubators) is an initiative that could fill in the existing gap, while fitting in perfectly between the university and industrial worlds.

ORIENTATION #7

Maintain the existing level of support while strengthening partnerships between the teaching institutions and entrepreneurship support organizations.

The conditions for supporting start-up companies are in place (incubators, etc.) and enable these start-ups to be autonomous. Marketing support is a vital component for which there are never to many resources.

Although teaching management skills cannot hurt, it should not be done to the detriment of the initial scientific and technical content. Instead, it should constitute a training elective or through extracurricular activities and be applied to the LSHT sector. According to the stakeholders, university diploma electives must be adjusted to this effect.

OBSERVATION #8

The recognition of training is not consistent.

The recognition of training if not consistent

Consultations have highlighted the need to propose to graduates alternatives to academic careers.

In fact, it seems that a vast majority of students go into graduate

programs with the sole objective to pursue an academic career, despite the limited opportunities in the academia and the many career possibilities in industry. With this in mind, companies perceive that university training, particularly at the doctoral level, guide graduates in the direction of research positions, which hinders the industry's recognition of other training programs.

The orientation towards academic research creates a problem of recognition of training programs

For certain employers that were met with, the pursuit of scientific training at the master's level means that the student in intent on becoming a scientist. This hasty categorization in the career of a professional may lead the student to a professional impasse – particularly in the case in which the student would be interested in his or her areas of expertise – and lead the student to consider positions proposed in other industries.

Future students, just like current students, know little about the existing training programs and industry needs.

Future students and the students engaged in programs of study know little about the needs of the industry and could hesitate or may simply not be aware of certain specialized training programs that are recognized or valued by industry. In fact, a college-level student with no industry knowledge is unlikely to choose a bachelor's program in bioinformatics. Furthermore, although a D.E.S.S. (specialized graduate diploma) is considered an asset (e.g. D.E.S.S. in drug development, D.E.S.S. in bioinformatics, etc.), undergraduate students are not necessarily aware that these training programs exist, or of the value placed on them by the industry, for their undergraduate education naturally pushes them in the direction of a master's, then a Ph.D., without considering other avenues.

ORIENTATION #8:

Identify valued career paths and training required by the industry to better guide current and future students

Current and future students in LSHT training programs know little about the sector and even less about career opportunities it offers. Also being unaware of companies' needs, they experience problems choosing appropriate academic programs or they unwillingly over-specialize in areas less prioritized by the industry. With respect to students in non-LSHT disciplines, they are unaware of all the practical implications and challenges they could face in the LSHT sector, of the information that could convince them to join the sector. All this information on LSHT careers is, however, available; it must simply be completed and distributed by programs promoted by the industry.

Internships fill a need in terms of talent and skills.

#9 Internships are valued as much by the industry as by

students.

Companies that seek and easily find experienced workers hesitate to host interns, while internships are highly valued by companies that offer them. The

companies hosting interns stand to gain as much as the interns themselves: companies benefit from the talent and from the most current knowledge in a context of a shortage of manpower and constantly developing skills, and interns develop skills that were not covered by their training, in the regulatory area and in business intelligence. In ICT, internships help to fill experience requirements, while other internships will enable interns to acquire certain skills in the notions of regulations, project management, business intelligence, etc.

The diversity in terms of the forms internships will take (upon graduation, mid-program or alternating between work and studies) does not seem to attract companies, while a one-size-fits-all internship would not satisfy all of companies' requirements. The lack of funding and supervisory staff are two disincentives to hosting interns.

ORIENTATION #9

Emphasize internships in the various training programs and promote the hosting of interns from different disciplines to develop hybrid and non-traditional profiles.

The terms and conditions of internships must facilitate participation by students and companies while ensuring that students graduate. The co-op internship arrangement seems very popular, and would increase and would increase students' placement in jobs while allowing them to develop their cross-sectoral skills.

The CEM, TECHNOCompétences and TechnoMontréal would recommend in particular that work-study programs be promoted to allow students to gain relevant professional experience for employers to diversify the internships offered (quantity, duration, types of internships, industries) and to lead junior professionals hired in companies to work with more experienced colleagues on specific projects to accelerate their technical learning curve.

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