

White Paper

Montreal, World Leader of Artificial Intelligence in the Life Sciences and Health Technology Sector: A Roadmap

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EXECUTIVE SUMMARY

Montreal is renowned for its concentration of expertise in artificial intelligence (AI) as well as for its dynamic life sciences and health technology (LSHT) ecosystem. In order to capitalize on its strengths in these two spheres and to rise to the rank of world leader of AI in LSHT, it will, however, be essential to move from an ecosystem focused on the production of innovations towards an ecosystem more favourable to their adoption and commercialization.

Stakeholders in the Montreal LSHT, AI and business communities have identified several priority actions to catalyze this development. In particular, the government's approach of innovation zones (IZ) is seen as an opportunity to facilitate the commercialization of locally developed innovations and to create an ecosystem distinguished by the opportunities that it provides for collaboration, outreach, and investment attraction.

The following elements are among the key ingredients identified for the success of an innovation zone for AI in health and, more widely, to position Montreal on the world stage of AI in LSHT:

- Bring together various influential stakeholders from the private and public sectors. The public sector is able to indicate the needs to be met, whereas industry is able to bring strong leadership to develop solutions, as well as the necessary investments to implement them;
- Implement clearer, transparent, and simplified procedures to access health data. This would include the implementation of secure IT environments that facilitate experimentation, but also flexible regulatory frameworks adapted to the development of AI in LSHT innovations;
- Achieve a paradigm shift towards management further supported by the measure of the value of innovations in the health network, with an aim to better inform the processes for their integration;
- Redefine existing procurement models of healthcare institutions by working with potential buyers (hospitals and procurement agencies) to facilitate the integration of innovations and adoption of new technologies thanks to a value-based procurement system;
- Build and attract a local talent pool whose competencies better correspond to the needs identified in the field;
- Support entrepreneurs in the AI in LSHT community by providing them resources, visibility, and collaboration opportunities with other stakeholders, notably within a IZ for AI in health;
- Bring together Montreal organizations with the mandate to coordinate the various aspects related to AI in LSHT.

Political will, will be a key factor in enabling these conditions to quickly materialize: competition with other jurisdictions is intense and Montreal must bring together the ingredients that will allow it to be among the most attractive destinations for those who want to invest, work, or market their AI in LSHT-related

innovations. The attractiveness of Montreal in this field will be an essential element for the economic recovery of Quebec, the sustainability of the Quebec healthcare system.

INTRODUCTION

On January 27, 2020 at Mila, Montréal InVivo and Montréal International presented their five (5) joint recommendations, based on AI in LSHT studies for which they mandated the firms Accenture and EY, respectively. The objective of these recommendations, presented in the appendix, is to position Montreal as a world leader in AI applied to the LSHT sector. The joint recommendations were the subject of workshops which, for each recommendation, aimed to identify the concrete actions that would lead to the target objective. More than 70 people participated in the workshops, including representatives from industry, government, research, entrepreneurship, hospitals, and investors, among others.

As part of Montréal InVivo's Strategic Committee for AI in LSHT, the consultation process of these key stakeholders continued into May and June 2020. These stakeholders were invited to brainstorming sessions to prioritize the implementation of the concrete actions identified and, to the extent possible, to identify the organizations that should be in charge of implementing them, as well as the partners to involve for their successful implementation. This white paper is the outcome of a process undertaken by the Montréal InVivo Strategic Committee for AI in LSHT for the first half of 2020, a period marked by upheavals caused by the COVID-19 crisis, but also by an awareness of the importance of the role of digital technologies, both for individual health and for population health.

The crisis has brought to light opportunities, notably in connection with telemedicine, but it has especially illustrated the necessity for better alignment between performance measurement in the healthcare network and its capacity to integrate the innovations that will contribute the most to improving its efficiency. During the crisis, difficulties in integrating this type of innovation in the healthcare system were observed even when they were provided for free. This highlights the importance of better understanding the obstacles that may have occurred and rectifying them. The time has come for real mobilization of political and administrative stakeholders at the provincial level to build on the knowledge gained from this crisis in order to take the necessary steps for better integration of locally developed innovations of AI in LSHT.

The urgency is greater now than ever: acting now to position Montreal as a world leader of AI in LSHT also means guaranteeing the dynamism of Quebec's economy, the sustainability of our healthcare system and health of our citizens. Quebec has all the necessary elements needed to be a leader in AI applied to LSHT; the priorities identified must be addressed quickly and in depth so that our province does not lose its momentum relative to other international jurisdictions.

CROSS-CUTTING RECOMMENDATIONS AND SYNERGIES

Montreal is known for producing innovations in AI for LSHT, hence its remarkable potential to position itself as a world leader. This potential is currently under-exploited in the LSHT sector due to local difficulties in integrating these technologies and innovations in the healthcare system. The primary objective, as well as the main theme of discussions to define the highest priority initiatives, is for Montreal to acquire the necessary resources and tools to evolve from a production ecosystem to an ecosystem which facilitates the adoption and commercialization of innovations in AI for LSHT. For this purpose, stakeholders have highlighted the following initiatives to activate first, while aligning them with those already in progress.

The Quebec government's initiative of innovation zones (IZ) aligns with the objective of this process, since according to the Ministry of Economy and Innovation (MEI), "the purpose of creating world-class IZs is to increase the commercialization of innovations, exportation, local and foreign investment, as well as the productivity of businesses" ([MEI, 2020](#)). The following recommendations are presented as key elements that will help to improve the success of any IZ initiative in connection with the life sciences and health technology sector. A better integration of digital technologies and innovations based on AI in any Montreal health innovation zone (HIZ), will also better strengthen the desired positioning for Montreal as a beacon for AI applied to LSHT.

It is important to highlight the parallels that can be drawn between the following recommendations and those from CIFAR's AI4Health Task Force published in July 2020 ([CIFAR, 2020](#)). The latter highlight the urgency of acting to maintain Canada's enviable position regarding expertise in AI applied in the LSHT sector, given the competition worldwide. The three (3) main recommendations of the CIFAR focus on 1) the implementation of an infostructure (as proposed by the national platform dhdp.ca) which ensures responsible access to health data while maintaining their security and confidentiality 2) the development of innovations by the private and public sectors, with incentives for strategic procurement and responsible scale up within the healthcare system, and 3) the implementation of various provincial/territorial and federal digital health initiatives in a way that it is aligned with an explicit strategy for AI in health, coupled with associated policies, investments, partnerships and regulatory frameworks.

1. Bring together influential stakeholders in order for the Montreal ecosystem to evolve from production toward adoption of AI innovations in LSHT

- Private industry has the willingness and ability to accelerate this process: it should, therefore, show strong leadership on this issue, both for the commercialization of AI in LSHT solutions that are well aligned with the clinical needs and ideally developed with users of the healthcare network, and to support their integration in the healthcare system.
- The healthcare network should be involved in these discussions and express the needs that may be met by the private sector (industry and start-ups) or research, among other things, through collaborative pilot projects and calls for solutions.
- Stakeholders from the private sector (including large industry players from the digital and LSHT sectors, as well as venture capital funds and other private funds) will need to play a leading role in this type of initiative by injecting resources. The Montréal InVivo Strategic

Committee for AI in LSHT already brings together a number of these stakeholders and can provide its support in terms of coordination by ensuring the mobilization of various stakeholders in the ecosystem.

- The objectives, anticipated benefits and incentives offered on investments in AI for LSHT in Montreal, more particularly in a HIZ, should be clearly defined to build a solid business case to position Montreal as a prized destination for local and foreign investors. This roadmap can be used to attract potential international investors.

2. Implement clearer, transparent, and simplified procedures to access health data

- The proximity of a HIZ with the hospital environment would improve data related to the clinical and economic value of innovations in a real healthcare setting. This proximity would enable the use of AI to solve problems related to the efficiency of processes to access healthcare data access, as well as those related to the lack of human resources and increasing healthcare costs. The accessibility and safety of healthcare data provided to stakeholders within a HIZ would, therefore, be key arguments for demonstrating its value.
- The FRQS, in partnership with several stakeholders (including government actors, the Ministry of Health and Social Services (MHSS), industry, associations and citizens), could map out the access procedures to various types of data with clear guides regarding governance and the process to follow in order to highlight best practices. This would allow for the implementation of standards for accessing clinical databases, and possibly a service for businesses within a HIZ that would enable stakeholders to be coached in their approach and to identify opportunities to collaborate with research partners to access such databases.
- A HIZ should include a shared service of complete and secure IT environments to work on healthcare data, in addition to providing opportunities for the stakeholders to share best practices for the ethical use of data, confidentiality, and cybersecurity. This service should facilitate the implementation of collaborative tools such as the national Digital Health Discovery Platform (DHDP.ca). Furthermore, the implementation in a HIZ of environments that enable innovations to be tested with factitious data initially, then with real datasets, would create a flexible, high added value experimentation framework for businesses and researchers wanting to test their innovations in Quebec. These initial tests would allow for quick adjustments of the innovation to optimize its connectivity with the IT systems of Quebec healthcare institutions and facilitate its integration in the healthcare network afterwards. The General Directorate for Information Technologies (Direction générale des technologies de l'information, DGTI) of MHSS should enhance the mandates of institutions' IT teams by allocating the necessary budget and resources to reflect their evolution towards a value-creating function capable of improving the healthcare system's efficiency. This includes investment in equipment that enables the use of AI to simultaneously analyze large volumes of data for clinical, research and performance improvement purposes.

- The MEI, the MHSS and the Ministry of Finance should grant additional budgets and resources for continuation of the work of the Table nationale des directeurs de recherche [National Table of Research Directors] (TNDR) to organize clinical and hospital data and define a framework allowing for the interoperability and connectivity of various sources of health data in Quebec.

3. Achieve a paradigm shift towards management supported by the measure of the value of innovations in the healthcare network to better inform the innovation integration processes.

- Improvements regarding the alignment of healthcare institutions towards clear objectives in terms of performance, notably with respect to cost savings and volume of activities, have already been seen. These should continue and indicators of success for innovations should be integrated to provide innovators with better bases on which to rely to demonstrate the value of their solutions and enable patients to benefit from them faster.
- Performance tracking mechanisms for the integration of innovations in institutional settings should be improved or implemented, if necessary, in order to better capture their value on clinical, economic, social, and business measures. A more systematic evaluation of value would also make it possible to better capture the real costs of delays in implementing innovative technologies.
- Promoters seeking to integrate their innovations in the healthcare system describe the complexity they encounter, as well as major administrative delays. It would be advisable to clarify and further simplify the administrative processes and requirements to demonstrate the expected value from the clinical, economic, social, and performance standpoints to better support integration of the innovations.
- The documentation and sharing of implementation experiences on the part of entrepreneurs would be a way of identifying the issues and obstacles that they have dealt with. This could also be used to inform discussions with relevant decisional bodies to implement concrete actions to make the processes simpler, more uniform, and better adapted to the needs on the ground. This would allow for a more effective adoption of innovations that promise high added value both for the health of patients and the performance of institutions.

4. Redefine the existing procurement models of healthcare institutions by working with the potential buyers (hospitals and procurement agencies) to facilitate the integration of innovations and the adoption of new technologies through a value-based procurement system

- The provincial government should, in partnership with organizations such as Innovative Medicines Canada or Medtech Canada, continue its development of a feedback mechanism from procurement agencies to those responsible for the implementation of innovations so that the ecosystem can continue to take advantage of experiences in the

adoption and deployment of innovations, while taking into consideration the particularities of those of AI in LSHT.

- Quebec ministries should implement “First Buyer in Quebec” programs that would subsidize part of the initial purchases of innovations designed in Quebec.
- The MHSS and its DGTI, the RAMQ, INESSS and hospitals should continue their work to organize and aggregate healthcare data. The observed gains would serve as leverage to encourage future projects aimed at increased integration of AI innovations in LSHT, by making it possible to measure their benefits on the health of patients, the cost of care and the efficiency of the healthcare system before and after their integration in pilot projects, beachheads or living labs.
- A HIZ is an ideal opportunity to test new value-based procurement processes. This is particularly the case if a HIZ offers access to health data, collaboration opportunities between stakeholders on innovative projects and consulting services that allow innovative businesses to demonstrate the value of their innovations.

5. Build a local talent pool whose skills better correspond to the needs identified on the ground

- Several new training programs in data science are currently being developed to supply the sector with cutting-edge expertise. It would be advisable to implement a consultation mechanism for the different curriculum developers who elaborate competency profiles and design adapted training. It would also be important to offer training with the aim of developing bilingual professionals in AI in LSHT, capable of identifying and applying solutions from one field to another. Curriculum developers would include, among others, universities, the Pôle IA (PIA), IVADO, the CHUM’s School of Artificial Intelligence in Health (SAIH) and OBVIA. Partnerships should also be considered with the Ministry of Education (ME), the Ministry of Higher Education (MES), Montréal InVivo, Pharmabio Développement, the AI/health axis of FRQS, as well as CIHR and CIFAR.
- There is a need for ongoing training for executives and managers in the LSHT and health sector. This should be provided by curriculum developers who are in a professional environment such as the SAIH, College Centres for the Transfer of Technologies (CCTT) or by a federation of training stakeholders such as PIA or IVADO. The ME, MES and the MEI are also potential partners in this process.
- The local talent pool should be enriched both by attracting the best talent from abroad and by monitoring the best practices seen internationally. The unique character of the HIZs will be an attraction factor for talent and the next generation of professionals from abroad. Montréal International Qualifications Québec would, moreover, be ideally positioned to attract this talent. The MEI could also implement measures to facilitate the arrival in Quebec of workers with an expertise in AI applied to LSHT.

6. Support entrepreneurs from the AI in LSHT community by providing them resources, visibility, and collaboration opportunities with other stakeholders, notably within a HIZ

- Economic development organizations, including Montréal InVivo, should improve existing tools for new businesses and develop new dynamic tools for AI in LSHT businesses that are easily accessible to all and provide, among other things, resources for financing, access to data, exportation, mentorship, and consulting expertise. Several tools are available in the entrepreneurial community; they could be reviewed and personalized for businesses active at the intersection of AI and LSHT.
- A HIZ should offer flexibility in terms of leasing policies to allow high-growth start-ups of varying sizes to continue to expand within it (e.g., premises set up in a modular fashion, flexible leases regarding moves, etc.). The physical proximity of the stakeholders of the business sector with the healthcare professionals and researchers within a HIZ, would also facilitate informal meetings, networking, and access to talent (future employees, young researchers, etc.) in shared spaces, during common events and conferences.
- The government should show its support for commercialization through matching funds and consulting services on business models of AI in LSHT businesses, to help them demonstrate the value of their innovations at different stages of their journey (regulatory approval, reimbursement, etc.). The MEI's Fonds de soutien à l'innovation en santé et services sociaux [Fund for the Support of Innovation in Healthcare and Services] (FSISSS) also represents an opportunity for businesses looking for this type of support, with the help of the Bureau de l'Innovation [Innovation Bureau] (BI) or MEDTEQ+.

7. Bring together Montreal organizations with a mandate to coordinate the various aspects related to AI in LSHT

- A consensus is forming that a new coordination entity should not be created for AI in LSHT, given the existence of such organizations as well as their complementary roles. Moreover, the Montréal InVivo Strategic Committee for AI in LSHT already brings together several of the organizations in question and would be able to provide its services and expertise to coordinate their efforts.
- The organizations mentioned during the consultations include Montréal InVivo (animation of the Strategic Committee for AI in LSHT, resources related to entrepreneurship in LSHT), Montréal International, the FRQS (funding of research and partnerships) and the Forum IA Québec (AI cluster across the sectors with a Canada-wide vision).
- Active concertation makes it possible to strengthen the connections between the organizations in question and to follow the progress of local AI in LSHT initiatives, with the aim of having better communication and greater coherence in their approach to the key issues and other coordination entities, both in Canada and internationally.

CONCLUSION

Montreal is at a turning point for its positioning as a leader among worldwide AI in LSHT hubs. The COVID-19 crisis has placed the LSHT sector in the spotlight and could represent a catalytic element for its transformation, by bringing to light both weaknesses that need to be addressed and opportunities to be seized. At the same time, citizens and patients are aware more than ever of the importance of innovations in this sector. Further discussions should be held with political leaders for collaborations between the various stakeholders to bear fruit, thanks to more favorable conditions to access data for commercial purposes, better integration of locally developed innovations, investments in resources for entrepreneurs in AI in LSHT, and training adapted to the future of the sector.

APPENDIX 1 – JOINT RECOMMENDATIONS FROM MONTRÉAL INVIVO AND MONTRÉAL INTERNATIONAL ON AI IN LSHT

1. Seize the opportunity to establish an innovation zone, comprising at least one physical space, with a strong brand image specifically focused on AI in LSHT;
2. Focus on an ecosystem entity that will be assigned the mandate of coordination, horizon scanning, and monitoring of progress in the AI in LSHT sector;
3. Favour an orientation focused on commercialization of AI in addition to that of research;
4. Develop and implement healthcare data access policy for Quebec;
5. Increase the talent pool specialized in AI applied to the LSHT sector.

APPENDIX 2 – ROADMAP OF PRIORITY ACTIONS TO IMPLEMENT IDENTIFIED BY MONTREAL STAKEHOLDERS IN AI IN LSHT

I. INNOVATION ZONE

"Seize the opportunity to establish an innovation zone, comprising at least one physical space, with a strong brand image specifically focused on AI in LSHT"

In order to position Montreal as a world leader of AI in LSHT, a HIZ should create and crystallize the synergies between various stakeholders, including industry, government, hospitals, research, the next generation of talent, venture capital funds, etc. The development of a brand image for AI in LSHT initiatives within a HIZ would also provide high-quality visibility to the Montreal ecosystem. A HIZ should be able to clearly define its offer and its distinctive character in order to capitalize on its strengths and address its weaknesses with the aim of attracting the funds and resources needed for its success. The quality and variety of stakeholders present in a HIZ will be the fertile ground that contribute to its success. A HIZ should also create favourable conditions for synergies between the stakeholders within the HIZ; therefore, the following actions must be implemented on a priority basis:

1. Bring together influential stakeholders to evolve the Montreal ecosystem from the production to the adoption of AI innovations in LSHT

- Industry should provide strong leadership, both for the commercialization and for the adoption of AI in LSHT solutions. Ideally, this leadership would be accompanied by an injection of resources and mobilization of various stakeholders. Private sector stakeholders should be involved because of their willingness and ability to accelerate the process. The provincial government and the MSSS should be involved, especially at the beginning to fund a HIZ, but also to support its development.
- Citizens, patient associations, patients, as well as their caregivers are the ultimate beneficiaries of the innovations developed within a HIZ. They should, therefore, be considered as partners so that the HIZ takes into consideration their needs and concerns in terms of health, but also in terms of their consent, safety, and confidentiality of their health data.

2. Implement a regulatory and IT environment favouring data access, scale up experimentation and collaboration between hospitals, researchers, and industry

The development of clinical and administrative data access procedures is a *sine qua non* condition to guarantee the success of a HIZ and its attractiveness for local and foreign investors. AI applied to LSHT cannot truly take off in Montreal unless the data, which constitute the basis of such innovations, are secured and accessible for researchers, industry, institutions, and governments. A HIZ should meet the conditions needed to test new ways of doing things with the aim of reducing the complexity and the length of the data access process, which will contribute to creating an operational dynamic that will facilitate the advancement of multicentre projects and studies. For this purpose, a HIZ should include the following elements, considered as priorities:

- The physical presence of an entity responsible for data access within the HIZ, with the implementation of clinical database access standards as well as a service enabling stakeholders to be involved in the data access processes.
- The implementation of a complete and secure shared IT environment service to work on healthcare data, as well as experimentation sandboxes (environments where innovations can be tested at first with factitious data, then with real data sets) and opportunities for stakeholders to share best practices in cybersecurity as well as various tools and platforms available.
- The facilitation of pilot projects involving hospital, industrial and academic environments making it possible to test and evaluate the barriers to implementing new AI in LSHT technologies in the institutions. This would mitigate the risks upstream of their introduction in the system and enable their efficient scale up. These pilot projects must answer the issues put forward by the healthcare centres and payors. Incentives should also be provided for by the government for AI in LSHT projects that require collaboration between institutions and/or other stakeholders (start-ups or SME, industry, and

researchers). Lastly, it will be important to provide for continuity and coaching of promising projects for their scale up beyond the pilot phase.

3. Attract local and international investments through the development of solid business cases and the support of local entrepreneurs

A HIZ must give itself the means of achieving its ambitions by attracting investments so that the innovations developed in Montreal can create economic value through their adoption and commercialization, both here and elsewhere in the world. It is important, therefore, to act on the following elements on a priority basis:

- Clearly identify the process and objective behind HIZs as well as the win-win opportunities for the different stakeholders involved.
- Improve existing tools for new businesses and develop dynamic tools for AI in LSHT businesses to facilitate their expansion through better access to resources for financing, exportation, mentorship, and access to data.
- Maintain an openness of the HIZ to the outside world by monitoring best practices in other AI in LSHT ecosystems internationally and by highlighting the achievements and success of the HIZ to attract talent and investments.

II. COORDINATION ENTITY

“Focus on an ecosystem entity that will be assigned the mandate of coordination, lookout and monitoring of progress of the AI in LSHT sector”

One of the limitations raised in Montreal, compared to the AI in LSHT hubs identified elsewhere in the world, is the absence of an ecosystem entity responsible for coordinating the AI in LSHT sector, particularly with respect to the evolution of a production ecosystem to an adoption ecosystem of such innovations. Of the roles to play in terms of AI in LSHT ecosystem coordination, the following are considered the most important:

1. Bring together various stakeholders of the AI in LSHT ecosystem and provide them with added value

- Bring together stakeholders from different areas to be representative of the AI in LSHT ecosystem and act as the interface with stakeholders from governments and other provinces.
- Improve communication between stakeholders of the AI in LSHT ecosystem to keep them informed of advancements in the sector.
- Be a service for AI in LSHT entrepreneurs that provides resources, tools, and opportunities to connect with experts or business partners.

The Montréal InVivo Strategic Committee for AI in LSHT already brings together several key stakeholders and represents a forum which facilitates their discussions regarding the progress of the AI in LSHT sector, particularly relating to the commercialization of innovations. The organization also has a vast network of collaborators, with several communication vehicles and a significant audience to whom it disseminates information both widely and in a more targeted manner. Lastly, Montréal InVivo would be able to improve the resources and tools that it makes available to AI in LSHT entrepreneurs and to continue to connect them with experts or business partners.

2. Position and promote Montreal as a worldwide investment and innovation destination in the LSHT sector

- Montréal International would be ideally positioned to coordinate the marketing of local AI in LSHT initiatives to foreign investors. It could take a leadership role towards foreign investors to develop and present business cases to demonstrate the advantages of choosing Montreal as the investment destination for AI in LSHT.
- This type of entity would also have a role in promoting Montreal to talent from abroad and in positioning Montreal and Quebec as prized destinations to work in the field of AI applied to LSHT. Talent from abroad would be an important ingredient in improving local competencies in AI applied in LSHT and it will be important to ensure that immigration programs are opened to them.

3. Attract the funds and support needed for the development of talent to design AI/health curricula and requalification programs

Forum IA Québec and Montréal InVivo, both play a role in developing training and competencies related to AI in LSHT, respectively. It will be important for these organizations, as well as those responsible for designing training programs (universities and CEGEPs, among others), to coordinate their actions with the following elements in mind, which are considered to be the highest priority:

- The real needs of businesses in terms of competency profiles must be identified upstream of the design of new training programs. It should be noted that Montréal InVivo is already working in partnership with educational institutions to develop a program to improve the competency profile of individuals trained in LSHT by offering them data science training with the aim of requalifying them to integrate the labour market.
- There is a real need for professionals capable of understanding concrete problems in the LSHT sector and then designing solutions for these problems using AI techniques. Training bilingual professionals in AI in LSHT is considered of higher priority for sector's evolution than having more experts trained in research.

III. COMMERCIALIZATION OF INNOVATIONS

“Favour an orientation focused on commercialization of AI in addition to that of research”

The commercialization of AI in LSHT innovations developed in Montreal is a vital point for its positioning as world leader in the sector. This objective transcends the recommendations associated with the creation of a HIZ, data access policies and talent development, which are means of guaranteeing the best opportunities to commercialize local solutions. The following actions have been identified as the highest priorities to achieve this:

- 1. Achieve a paradigm shift towards management further supported by the measure of the value of innovations in the health network with an aim to better inform the innovation integration processes**
 - Improvements regarding the alignment of healthcare institutions towards clear objectives in terms of performance, notably with respect to cost savings and volume of activities, have already been seen. These should continue and indicators of success for innovations should be integrated to provide innovators with better bases on which to rely to demonstrate the value of their solutions and enable patients to benefit from them faster.
 - Performance tracking mechanisms for the integration of innovations in institutional settings should be improved or implemented, if necessary, to better capture their value on clinical, economic, social, and business measures. A more systematic evaluation of value would also make it possible to better capture the real costs of delays in implementing innovative technologies.
 - Promoters seeking to integrate their innovations in the healthcare system describe the complexity they encounter, as well as major administrative delays. It would be advisable to clarify and further simplify the administrative processes and requirements to demonstrate the expected value from the clinical, economic, social, and performance standpoints to better support integration of the innovations.
 - The documentation and sharing of implementation experiences on the part of entrepreneurs would be a way of identifying the issues and obstacles that they have dealt with. This could also be used to inform discussions with relevant decisional bodies to implement concrete actions to make the processes simpler, more uniform, and better adapted to the needs on the ground. This would allow for a more effective adoption of innovations that promise high added value both for the health of patients and the performance of institutions.

- 2. Facilitate the integration of AI in LSHT innovations and the adoption of new technologies by making data available that allows for the impact of their deployment to be measured, with the aim of evolving towards a value-based procurement system**

- One of the priority actions identified for this purpose would be the development of an feedback mechanism for procurement agencies to those responsible for the implementation of innovations.
- This mechanism would enable the ecosystem to continue benefiting from the experiences in the adoption and deployment of innovations, while taking into consideration the particularities of those of AI in LSHT. while gaining a better understanding of their benefits (notably in terms of productivity and performance for the implementation agency, but also in terms of cost and benefits for patients) and possibly identifying avenues for improvement. It would also be advisable to implement a team specialized in the integration of health innovation within the government procurement centre.
- It would be advisable for procurement mechanisms to evolve to better integrate innovations; notably, encouraging wider problem solving through innovative products rather than by purchasing solutions for an immediate need.
- The provincial government should lead these actions in partnership with organizations such as Innovative Medicines Canada and Medtech Canada.

3. Support entrepreneurs from the AI in LSHT community and favour the implementation of pilot projects, notably within a HIZ

AI projects applied in the LSHT sector are a promising avenue towards commercialization, particularly for collaborative projects involving healthcare centres, industry, and researchers. It is important, however, to implement mechanisms that ensure the continuity of these projects beyond the pilot phase. The priority actions to implement in connection with this objective would be:

- Propose a coaching path to innovators and entrepreneurs in healthcare and social service organizations to accelerate the innovation cycle.
- Offer businesses the tools, resources and coaching needed to develop their projects for AI in LSHT, including financing, data access, connections with the right partners, consulting expertise and exportation. These could be offered by economic development organizations as well as provincial and federal governments.
- Offer fund matching on the part of provincial and federal governments for promising projects involving several stakeholders, particularly those within a HIZ.

4. Increase the visibility of achievements in Canada internationally to attract private stakeholders and investments

International investment attraction agencies, including Investissement Québec International and Montréal International, would be ideally positioned to ensure the visibility and attractiveness of Montreal beyond Canadian borders. More specifically, the following actions should be implemented on a priority basis:

- Organization of calls for proposals, competitions or annual investor days that target business organizations in the pharmaceutical and healthcare sectors. The latter would then have the opportunity to discover Montreal’s latest innovations at the intersection of AI and LSHT. This type of event should highlight local businesses and include a workshop that enables participants to meet and determine how these large businesses could benefit from the expertise in Quebec. They would be able to put forward problems that they want to solve and invest in the most promising solutions and SMEs. The proposed leaders of such an initiative would include Montréal International, Mila, the HIZ and venture capital groups.
- Implementation of a common showcase and a physical showroom for innovative IT products in LSHT. Combined with facilitator support, this will bring added value to the users and examiners by enabling them to test the innovative AI in LSHT products on site rather than remotely.
- Promotion of Montreal as a choice destination for international talent specialized in AI applied in LSHT, both for new and experienced professionals, as described in sections II and V of the appendix of this white paper.

IV. DATA ACCESS POLICIES

“Develop and implement a Quebec health data access policy”

Health data access has already been highlighted by the stakeholders in the sector as an essential aspect for the future of LSHT, notably in the memoirs of Montréal InVivo on health data access ([Montréal InVivo, 2020a](#)) and on the integration of technological innovations in the healthcare network ([Montréal InVivo, 2020b](#)), submitted in January 2020 as part of pre-budgetary consultations of the Ministry of Finance of Quebec. Several of these recommendations apply precisely for the question of AI in LSHT. The actions identified by consulted stakeholders as the highest priority to improve access to health data for purposes of innovation in LSHT are:

1. Organize healthcare data

- The MEI, the MHSS and the Ministry of Finance should grant additional budgets and resources for continuation of the work of the TNDR to organize clinical and hospital data and to define a reference framework allowing for the interoperability and connectivity of various sources of health data in Quebec.
- These entities, as well as the institutions that are the most advanced in the matter, should also coach organizations in the implementation of data lakes according to best practices, to support both performance as well as research and innovation. For the latter component, the FRQS (financing of research and partnerships) would be a partner to consider.

2. Propose changes to the mandates of IT teams of institutions by allocating the necessary resources

- The MHSS's DGTI should propose changes to the mandates of IT teams in institutions and allocate them the necessary budgets and resources to reflect their evolution from a function dedicated solely to maintaining operations towards a value-creating one capable of making improvements in the efficiency of healthcare. This includes investments in equipment enabling the use of AI to simultaneously analyze large volumes of data for clinical, research and performance improvement purposes.
- The first step proposed to this end would be to identify the priority elements that should be renewed in the IT park within the institutions, for example the data storage capacity and network.

3. Map the health data access procedures and document the obstacles

- The FRQS, in partnership with a number of stakeholders (including government actors, the MHSS, industry, associations and citizens), could improve access to health data by mapping the access procedures to various types of data with clear guides. This mapping would begin from the collection of patient consent and approval from the research ethics committees. To start with, the different steps must be documented (delays, sequence, and levels of difficulty) to access data in different situations.
- It would be advisable for this mapping to result in the implementation of standards for accessing the clinical databases and eventually a service for businesses within a HIZ, enabling stakeholders to be coached in their data access processes and for obstacles and sources of inefficiency to be identified. At the very least, it would be advisable to establish a clear path with support for accessing data (application form, clear legal and ethical framework, commitment to confidentiality, etc.). This path would be defined for research contexts, real-world outcomes measures and private commercial purposes.
- Mechanisms would need to be established to document blocking elements in pilot projects to facilitate their culmination in more sustainable, scalable initiatives.

4. Offer a secure, shared IT environment service, notably within a HIZ

A HIZ should include a shared service of complete and secure IT environments to work on healthcare data, in addition to providing opportunities for the stakeholders to share best practices in cybersecurity. The implementation of environments that enable the testing of innovations with fictitious data initially, then with real data sets in a HIZ, would create a flexible experimentation framework which would represent high added value for businesses and researchers wanting to test their innovations in Quebec.

V. TALENT AND TRAINING

“Increase the talent pool specialized in AI applied to the LSHT sector”

The development and commercialization of local innovations in AI applied to LSHT will be strongly influenced by the presence of a specialized talent pool in Montreal. The implementation and integration of such innovations will require a better understanding of their technical and managerial issues, both for professionals and managers. In addition, since the COVID-19 crisis has demonstrated the importance of LSHT and digital technologies, both for the general public and in the healthcare system, there is a momentum to seize to attract young people and professionals through retraining. The following priority actions were proposed during consultations:

1. Development of competency profiles and development of adapted training, including for translators acting as the link between AI and LSHT

- A consortium of curriculum developers who collaborate to elaborate competency profiles and to design adapted training should be set up. This would also include training to create bilingual professionals in LSHT and in AI or in business, capable of identifying and applying solutions from one field to another. The program designers would include, among others, universities (Université de Montréal, McGill University and Concordia University), Pôle IA, IVADO, the SAIH, OBVIA and CEGEPs. Partnerships should also be considered with the ME and the MES, Montréal InVivo, Pharmabio Développement, the AI/health axis of FRQS, CIHR and CIFAR.
- Some programs are already ongoing, including the Continuum en sciences des données de la santé [Health Data Sciences Continuum] project, developed by Montréal InVivo in collaboration with Pharmabio Développement, Qualifications Québec and Cégep Ahuntsic, to develop the competency profiles required with the aim of enabling professional requalification and integration of the labour market for new arrivals and job seekers; this program would allow for training in enterprise settings. Technocompétences is also conducting a study of AI profiles, including translator profiles; although this study mainly targets the technology sector, this will undoubtedly serve as inspiration for the LSHT sector. It would also be relevant to create a directory of existing programs and a box of ongoing or upcoming initiatives.
- We highlight the importance of making the population aware of the importance of digital technologies for health and of developing training to create better digital literacy of the general public, from elementary school to CEGEP.

2. Design and offer of continuing training for professionals already in the workforce

- There is a need for a continuing training offer for executives and managers in the LSHT and health sector. This should be provided by the program designers who are in the practice environment such as SAIH, CCT or by a federation of stakeholders in training such

as the Pôle IA or IVADO. It should be noted that the latter already offers this type of training; it would, therefore, be desirable to multiply them and favour access to them. The ME, the MES and the MEI are potential partners in this type of process.

- It would be relevant to design non-traditional pedagogical methods (e.g. short online certification, practicums, learning expeditions, a week in another enterprise, exchanges, etc.)
- A research group at TELUQ is working on developing management profiles in AI for Industry 4.0, which could represent a starting point for adaptation to the LSHT sector.

3. Attraction of international talent and know-how

- The local talent pool should be enriched both by attracting the best talent from abroad and by monitoring the best practices seen internationally. The Government of Quebec is reviewing its programs for attracting personnel in AI; it will be important to ensure that the sector participates in these consultations. Attracting talent could be done through recruiting missions in universities highly recognized for their training in AI in LSHT or by identifying expatriates who may be interested in repatriation. Forum IA and OBVIA have quite close ties with the Quebec delegations abroad and could contribute to this identification.
- Montréal International and Qualifications Québec would also be ideally positioned to attract these talents. In addition, it would be advisable that businesses themselves could benefit from support to be able to make competitive offers to these often very sought-after talents. The Ministry of Immigration and Employment could also facilitate their arrival in Quebec, notably through the implementation of coaching services help them navigate the immigration process, which can be quite complex.
- The sharing of international know-how would be favoured through the monitoring of best practices as well as by the creation of or participation in virtual courses accessible worldwide.