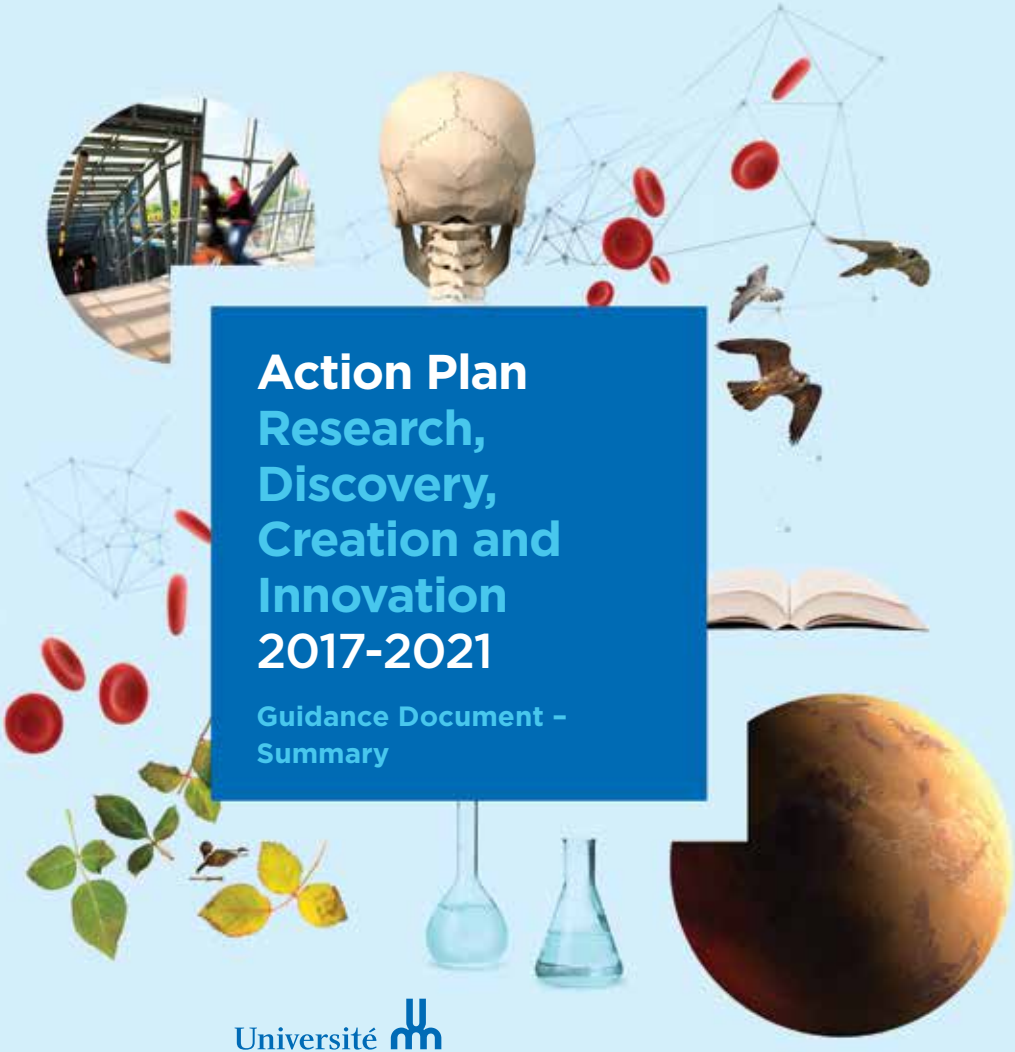

Action Plan
Research, Discovery, Creation and Innovation 2017-2021

Guidance Document – Summary

Université de Montréal

The university of Montreal and of the world.

Summary

Université de Montréal is one of the largest research hubs in Canada and the French-speaking world. At a time when multiple fundamental forces of change are intersecting, academic research and scientific rigour are more important than ever. This guidance document positions the research and innovation activities of Université de Montréal in a global context. It takes into account UdeM's performance in research and teaching, its unique role in the communities of Montréal, Québec, and Canada, and its international, national, and provincial public policies and strategies for research and innovation. It supports research by affirming its primary objective: the discovery, advancement, and mobilization of knowledge.

Orientations and development strategies

This section presents the results of analysis and consultations through the The orientations and development strategies that will guide our actions over the next years in research.

Five strategies are used to guide our orientations:

1. Identify cross-cutting research topics that combine various hubs of excellence and strengthen the process of starting and supporting major research projects;

2. Facilitate the Innovation Laboratory to stimulate links between research and teaching activities and ensure their relevance in programs through the implementation of major projects;

3. Implement a research equity and diversity plan;

4. Increase support and training services that promote and model responsible conduct in research;

5. Identify policies that support broad and open dissemination of knowledge and research data produced at UdeM.

Strategic orientations

The aspirations of Université de Montréal regarding research, discovery, creation, and innovation can be summarized by our strategic orientations:

1. Affirm the positioning of UdeM as a powerful vector of discovery, creation, and innovation;

2. Support the development of world-class research, creation, and innovation environments positioned at the interface of our hubs of excellence;

3. Stimulate the training of next-generation researchers and creators to remain at the forefront of knowledge;

4. Provide a model environment for diversity, equity, and responsible conduct in research;

5. Increase the impact of UdeM research and its contribution to society;

Four structuring research projects

Structuring research projects bring together cross-cutting research topics to cultivate interactions between faculty, academic units, and partners, and establish close links between studies and research. These projects are based on unique interdisciplinary encounters whose purpose is to propose original and fruitful perspectives that offer answers to today's issues.

Project 1 — **From Data to Action in Health**

Recognized hubs of excellence in data science and artificial intelligence come together at the Institute for Data Valorization (IVADO), which has received a $93.6 million grant from the Canada First Research Excellence Fund. IVADO contributes to the advancement of knowledge and to training the next generation of data scientists at the cutting-edge of operational research and deep learning, and promotes the development of a new economy evolving around massive data processing to support decision-making.

The project From Data to Action in Health, in conjunction with IVADO, aims to increase research and training opportunities at the interface between artificial intelligence, operational research, and life sciences. The project will bring together the best of research in oncology, immunology, and cardiovascular and metabolic diseases. It will create or strengthen links between data science, biomedical sciences including therapeutic innovation and drug discovery, “omic” approaches, personalized health, imaging, patient expertise, health systems, ethics, and legal aspects, with the goal of adopting an interdisciplinary approach to the valorization of health data, in a perspective of social acceptability.

Project 2 — **Understanding and Creating. Creating to understand**

Understanding and Creating brings together the humanities and social sciences and arts and letters in an interdisciplinary perspective and provides an opening to intersectoral cooperation. The initiative is based on the premise that research and teaching can be an extraordinary way to empower people and communities based on their needs, strengths, and aspirations. The project was born from a firm desire to promote university-community permeability. It advocates the co-creation of knowledge and practices as well as research-creation as a space for dialogue and reciprocity with communities. The approach may involve the creation of a piece of work, a product, a material or virtual environment, a training activity, or a service, among other things. Within the framework of Understanding and Creating, objects may include experiential knowledge, memory, culture, heritage, digital humanities, narratives, and the relationship between the arts, society, and the environment.

In addition to generating new teaching and research initiatives that may take such forms as interdisciplinary summer schools, field-based training organized around missions or challenges from the public, and innovative co-creation or research-creation projects, the project will develop new ways of interacting with the community, in particular, through the establishment of a platform for interaction with the public.

Project 3 — **Building a Sustainable Future**

Building a Sustainable Future brings together sectors of excellence from the fields of natural sciences, humanities and social sciences, public health, political science, and law — with a special purpose: to work in a coherent and concerted way to equip citizens and decision makers to confront socio-environmental and humanitarian challenges in a sustainable way.

The project will foster, among other things, closer links between our hubs of excellence in the areas of new materials, energy, transportation, public health, microbiology, animal welfare, biodiversity, land-use planning, and related regulatory mechanisms. The project will also build on the success of on-going interdisciplinary and inter-institutional initiatives, including IVADO, as well as our hubs of excellence in operational research and artificial intelligence.

Project 4 — **Life Rethought**

This project brings together the strengths of research in neuroscience, mental health, vision, rehabilitation, development, aging, and computational neuroscience to increase opportunities for innovation through the collision of ideas and expertise. The project is rooted in our hubs of excellence in both human and animal health and embraces life from beginning to end. It promotes exchanges between teams interested in early life and childhood, and seniors and end of life.

The project enables collaborations that touch on both the physiological mechanisms of development and aging and the social, organizational, and political interrelationships underlying the demographic changes that characterize 21st century society. Thus, by considering life from beginning to end, and its organization, this project calls us to review our fundamental understanding of thought, language, memory, movement, and learning, as well as individual and collective mechanisms and technologies of adaptation.

Sectors of excellence for UdeM

UdeM's sectors of excellence are the result of concerted development efforts and investments over many years. Each sector targets a unique field of research, research that is exceptional and impactful, as well as an innovative approach to research and creativity, with great potential for interdisciplinarity.

Our sectors of excellence form the foundations on which we base the development of strategic original and innovative groupings. In this section, the sectors are presented from a series of keywords that focus on specific fields of expertise.

Appendix

List of sectors of excellence

1. Acquisition of knowledge

- Theories, policies, measures and ultimate goals of education
- Images in motion
- Languages (oral, musical, visual, digital, the teaching profession — education)
- Learning, psychology and development

2. Creation and experiential knowledge

- Research-creation (music, film, design, urban planning, architecture, literature)
- Co-creation/co-construction, reception and audiences (narratives, urban planning, music, patient involvement, community involvement)
- Digital humanities
- Indigenous perspectives and practices
- Gender studies (diversity, equity)
- Film, art history and video games

3. Imagination, values and collective heritages

- Diversity and interculturalism
- Language, literature and society
- Intermediality (music, film, literature, communication, video games, interactive design, art history)
- Religions and sociocultural perspectives of the sacred
- Memory, heritage and civilization (digital and conservation tools)

4. Foundations of reality

- Mathematics
- Physics and foundations of matter
- Universe and exoplanets
- Nature of reality, philosophy, cosmogony

5. The brain, thinking, perception

- Cognition and neurosciences (motor control and oral motor control, vision, pain, musical neurocognition, trauma, CVA, sleep, organic brain syndrome)
- Neuropsychology and psychology
- Epistemology (anthropology, linguistics, sociology)

6. The life cycle

- Beginning of life (reproduction, conception, birth, prematurity)
- End of life (aging, death)
- Development (adaptation through life, developmental psychology and biology)
- Extremes of life (health, adaptation to school, adapted environments)

7. Social and political organization

- Family and communities (new family models in health care)
- Demographic change (migratory flows, Indigenous communities, intergenerationality)
- Society and living together (organizational communication, labour market, regulation, security, transportation and mobility, social inclusion, social justice and vulnerable individuals, consultation and public debate, public space, transformation of cities, new economic models, microcredit)
- International relations (mobility and international trade, globalization and circulation of legal models)

8. Biodiversity

- The food industry and animal health (animal welfare, zoonoses, urban agriculture)
- Fabricating nature
- Plant biodiversity
- Population health

9. Ethics and politics

- Ethics, equity and fundamental rights
- Law and emerging technologies - cyberjustice
- Cybercrime, cybersecurity
- Legislation and public policy
- Privacy, confidentiality
- Social responsibility and justice
- Governance and regulation
- Socially responsible development of artificial intelligence

10. Determinants of health

- Psychological, sociological and economic determinants (mental health, aggression, violence, social and economic status, inequalities)
- Genetics
- Lifestyle habits (physical activity and exercise, cardio-metabolics, nutrition, hygiene and oral health)
- Host-environment links (toxicology, built environment, immunology-Infection-Inflammation)
- Oncology
- Chronic illnesses
- Quality of life

11. Collective systems

- Political systems (globalization and internationalism, individual and collective rights, diversity and social inequalities, demographic change, governance and communities)
- Health systems (international health, health-care system, Indigenous health, rights and legislation, organization of work, public health)
- Education systems (education policy, measures and assessments, diversity and inequality, learning places)

12. Environment and sustainable development

- Environment (water, eco-toxicology, energy, climate change)
- Sustainable development (green chemistry, electrification, land use planning and the landscape, memory and heritage, sustainable living environments, energy, logistics, transportation, sustainable services and products, reconstruction, circular economy, governance, corporate social responsibility)

13. Data in action

- Artificial intelligence (machine learning, deep learning, neural networks)
- Science of decision-making (mathematical optimization, operational research, bioinformatics)
- Statistics (biostatistics, social statistics)
- Digital and information sciences
- High-throughput approaches (genomics, proteomics, metabolomics)
- Recognition (imagery/image, language, movement, data visualization)

14. Therapeutic innovation

- Chemistry of health and medicinal chemistry
- Nanomedicine
- Immunotherapy and cell therapy
- Rehabilitation
- Personalized and precision medicine
- e-health (e-health, oral e-health, game therapy)

15. Innovative systems

- Information technologies in teaching
- Learning health systems
- Transformation of systems (health care, education, politics, law)
- Human interactions in a digital world (virtual reality, distance collaboration, video games, digital tools and conservation, security)

16. New materials

- Nanotechnology
- Innovative materials
- Tissues and membranes
- Innovative use of materials

Office of the Vice-Rector Research, Discovery, Creation and Innovation

› **MAILING ADDRESS**

PO Box 6128
Downtown Station
Montréal, PQ
H3C 3J7
CANADA

› **CIVIC ADDRESS**

2900, Édouard-Montpetit Blvd
Montreal, PQ
H3T 1P1
CANADA

Université de Montréal The university of Montreal and of the world.

Produced by the Office of Communications and Public Relations,
April 2018 [1-14-4066]