

2018–2022 Strategic Planning — Unifying Research Themes

PREAMBLE

Research at the University has many distinctive features. In many sectors, translational research, which involves the continuum from basic research to knowledge translation, is clearly one of our strengths. In fact, the research carried out at the University is reputed for influencing practices in a variety of settings and contexts.

Interdisciplinarity is also a characteristic that enables some of our research groups to excel in their collective achievements. The development of certain technology platforms and the acquisition of major scientific infrastructure shared by several research groups over the last few years have also accelerated discoveries. While some faculty members and their teams have significant reach, including in popular media, we all too often still hear that Sherbrooke scientific breakthroughs and discoveries are well-guarded secrets.

As a general rule, modern research should focus on responding to major social issues and society's specific needs. That would justify its relevance and facilitate funding. Such research very frequently makes use of multidisciplinary and interdisciplinary approaches because major discoveries often lie at the boundary between disciplines. Nevertheless, researcher excellence and engagement are crucial in pushing back the boundaries of knowledge.

Three elements figure prominently in research and graduate studies at the Université de Sherbrooke: sustainable development; the principles of equity, diversity, and inclusion; and partnering.

- A. Sustainable development is development that meets the needs of individuals and society without compromising the ability of future generations to also meet their own needs.¹ Sustainable development is a *sine qua non* fundamental principle of all of our research.
- B. Equity, diversity, and inclusion are fundamental values in building high-quality research teams. Each individual carries their own specific baggage. Coming together as a team provides different perspectives in solving today's most complex issues.
- C. Developing a network of high-quality partners—academic, public, and private—is a guarantee of success for research firmly rooted in society. This makes it possible to foster applied knowledge-mobilization applied knowledge-mobilization and the changes to policies and practices required for the advancement of society.

UNIFYING THEMES

With the goal of accelerating research development at the University and to enable the community to solve complex issues requiring multidisciplinary approaches and having a significant societal repercussions, the new management team spearheaded an exercise in 2017 to identify unifying themes.

The unifying themes also had to speak to the University research community as well as government bodies, external partners, and the general population. A unifying theme is a institutional commitment adhered to by a critical mass of researchers working to push back the boundaries of knowledge. It is important to underscore that the purpose of identifying unifying themes in no way aimed at having original and individual research take a backseat. Indeed, it was to promote the creation of intersectoral and inter-faculty groups. A unifying theme is not limited to technical aspects. On the contrary, it must take into

¹ *Report of the World Commission on Environment and Development: Our Common Future* (Brundtland Report). World Commission on Environment and Development. United Nations (1987). <http://www.un-documents.net/our-common-future.pdf>

account the social responsibilities and societal needs associated with this research work. A reflection process lasting several months and involving the consultation of hundreds of people led to the identification of six unifying themes briefly described below.

Togetherness: Culture, Plurality, Governance, and Equity

Togetherness can be described as the capacity and consent of socially and culturally diverse people to harmoniously share their living environment. Societal togetherness rests on mutual respect, acceptance of the plurality of individuals and opinions, interactions rooted in openness and cooperation, caring relations, and the refusal to ignore or harm one another². Societal togetherness allows for affirming different identities, valuing sociocultural diversity, and ensuring equity in living and work environments as well as within public services.

Keywords Diversity. Vulnerable populations and clientele. Social and political organization. Social governance. Publishing and reading. Ethics. Secularism and religion. Plurality. Minority groups. Sex and gender. Interculturalism. Cultures and cultural knowledge. Social cohesion. Normativity. Dispute prevention and resolution. Quebec literature. French language and francization. Social services. Responsible management. Public policy.

Digital Age: Intelligent Organizations and Training

Rapid expansion, broad accessibility, and the universal adoption of digital technologies impact how we think, reflect, teach, train, work, interact, and communicate.³ The digital world, including big-data analysis, can indeed be found in every aspect of life, affects individuals of all ages, and raises many challenges in training channels and all way up to social and economic effects.

Keywords Cultural, educational, and technological aspects of the digital era. Use of social media. Digital literacy. School success and perseverance. Artificial intelligence. Teaching and learning. Open data. University pedagogy and teaching training. Economy and the tax system. Integrated and intelligent systems. Ethics and private life. Responsible management.

Innovative Materials / Processes and Quantum Science

Intelligent materials are able to react to external stimuli in order to adapt to changes in environmental conditions, perform a task, or fulfill a specific function.⁴ Innovative processes play an increasingly important role in developing cutting-edge technologies and in our society. Quantum science, which fall between basic and applied sciences, will revolutionize materials, technologies, and the nature of information as well as how it is processed and transmitted.

Keywords Information and quantum mechanics. Nanotechnologies and technological innovations. Computer systems. System automation. Composites and material advances. Development of innovative materials. Medical imaging. Information processing. Artificial intelligence. Microelectronics. System miniaturization and performance improvement. Quantum technologies.

² Graines de paix. Solutions éducatives pour une paix durable. http://www.grainesdepaix.org/fr/ressources-de-paix/dictionnaire-paix-education/vivre_ensemble_bien_vivre_ensemble

³Government of Canada, *Building Digital Skills for Tomorrow*. <https://www.ic.gc.ca/eic/site/028.nsf/eng/00041.html>

⁴ Zhao, Y, "CPH 715 Conception de matériaux intelligents." Course notes. Université de Sherbrooke. https://www.usherbrooke.ca/physique/fileadmin/sites/physique/documents/Plan_de_cours/cph715.pdf

The Environment and Climate Change

As the century begins, climate change is considered the most powerful factor affecting the planet's ecosystems and our lifestyles. Sustainable development refers to the creation or transformation of environments or settings adapted to different contexts as well as the implementation of economic and sustainable solutions to ecological and societal problems without compromising natural and social environments.

Keywords *Sustainable development. Sustainable infrastructure and advanced materials. Environmental, social, and economic aspects associated with the use of natural resources. Geomatics. Ecology and ecosystems. Hydrology. Energy efficiency.*

Health: Promotion, Prevention, and Precision Approaches

Public health deals with the organized efforts deployed by a society to keep its population healthy and avoid injury, chronic diseases, psychological problems, and premature death. It consists of a blend of programs, services, and policies aimed at protecting and promoting physical and mental health as well as the positive social adaptation of individuals.⁵ Precision approaches aim at delivering the right treatment or intervention at the right time to the individual as a whole. From a standpoint of individual accountability and considering the importance of different forms of prevention, the development of personalized interventions adapted to populational and personnel contexts from an interdisciplinary perspective stands out as a major challenge.

Keywords *Mental and physical health. Biological and social determinants of health. Organizational health. Risk behaviors. Health-care organization. Health ethics and legislation. Prevention and health promotion. Rehabilitation. Primary health care. Interdisciplinary and integrated health-care approaches. Maladjustment and social intervention. Neuroscience, pharmacology, microbiology, endocrinology, genomics, medical imaging, etc. Basic understanding of biological mechanisms.*

Population Aging

Significantly improving living conditions and health care help increase life expectancy. One of the consequences is a growing number of the elderly with or without chronic diseases. From this standpoint, population aging and the scope of the changes it involves can lead us to challenge our approaches and might even prove to be an opportunity. Preventing chronic diseases and cognitive decline as well as promoting health maintenance and independence are solutions. There are also many societal stakes related to aging. Better understanding and acting on the physical, social, organizational, and political environments as well as their interactions are essential to promoting social participation and better aging.

Keywords *Life-span approach. Active aging. Healthy lifestyles. Adapting the living setting and society. Ethical, economic, and legal aspects of aging. Chronic diseases associated with aging. Independence. Environment and adapted services. Neuroscience and cognition. Individuals in vulnerable situations. Life trajectories.*

⁵ Leatherman S. and Sutherland K. *Quality of Healthcare in Canada: A Chartbook*. Ottawa, ON. CHSRF. 2010. https://www.cfhi-fcass.ca/migrated/pdf/chartbook/CHARTBOOK%20Eng_June_withdate.pdf