STRATEGIC RESEARCH PLAN

DOING RESEARCH DIFFERENTLY

2022/2027
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At École de technologie supérieure (ÉTS), we believe that scientific research should serve the common good. We also believe that we must provide the right conditions for knowledge to flow freely, not only among academic disciplines, but among all actors of society. This is the right approach for finding the best solutions.

We have the means to realize our ambitions: We are currently among the leading engineering universities in Canada, with 25% of all graduates in Québec being trained at ÉTS. We have the world-class research expertise and infrastructures we need able to meet the great challenges of the 21st century.

Breakthroughs will be achieved in collaboration with our many partners, because we have established strong ties with key players from diverse backgrounds over the years, including private companies, government departments, municipalities and hospitals. Since our first engineering research programs were created in the early 1990s, we have always strived to find practical solutions to real problems.

We are ready, and as motivated as ever, to do what we have always done best: Think differently to do research differently.

- Christian Casanova
In 1974, ÉTS launched an entirely new university model, offering training to students who had a strong technical background while placing great importance on practical work, laboratory activities and internships.

In order to meet the needs of society, it is only natural to expect our teaching staff to have this same spirit of innovation in their research endeavors.

Our professors strive to establish collaborations that are in tune with the needs of industry so that their research produces tangible and positive outcomes for society. As active and dynamic as ever, ÉTS ranks 15th in Canada in terms of research intensity and 4th among universities without a medical school, according to Research Infosource (2020).

As evidence that our partners trust in the expertise of our research teams, consider that the amounts awarded in grants and research contracts have steadily increased by 11% per year from 2000 to 2020.

Our approach has led to the creation of long-term partnerships, to our students working in companies and to the development of innovative concepts that are of service to the community.

Our model has proven to be effective and has inspired other establishments; and it is flourishing. ÉTS has a strong and positive economic and social impact, thanks in part to its contribution to the creation of businesses and the numerous transfers of intellectual property to industry and other organizations. From 2016 to 2021, more than half of the protected innovations created in our laboratories were transferred to an industrial partner pursuant to a technological transfer agreement. This has had a considerable positive impact on the academic world and a significant positive economic impact on our research.

We are currently ranked first in Québec in terms of the number of engineering graduates, 93% of whom say they are very satisfied with their experience at ÉTS.

We are proud to note that ÉTS will soon be celebrating its 50th anniversary, and over that time, it has managed to maintain its flexibility, audacity and unique character. It has become a key player in the economic development of Québec and Canada.
Solving Real Issues

60% of the research activities at ÉTS involve projects conducted in collaboration with companies, non-profit organizations, municipalities or government departments. The nature of these research contracts is varied, ranging from research and development contracts with partners to strategic sectoral projects, projects conducted in collaboration with students at the undergraduate and graduate levels and even access to research infrastructures and research expertise. In addition, the vast majority of our faculty members have not only graduated from leading engineering schools, but also have experience working in industry.

Participating in International Networks

We consider the internationalization of educational and research activities and the deployment of industrial relations abroad to be priorities for the continued development of ÉTS. With our more than 100 international partnerships, our innovative student mobility models, our scientific outreach and technology transfers with a sphere of influence that extends beyond our borders, there is no doubt that ÉTS is contributing to the enhancement of Québec’s reputation abroad through the deployment of its international activities.
We are actively working to expand and diversify the parameters used to evaluate excellence in research. True to our innovative nature, we were the first Québec university, and among the first in Canada, to sign the San Francisco Declaration on Research Assessment (DORA). While published articles continue to signify an institution’s contribution to research, there are other parameters to be taken into consideration in evaluating the impact and excellence of our researchers, including data sets, software development, protocols, training, policy changes and social and economic benefits resulting from research.

We are convinced that an individual who has demonstrated resilience and perseverance in the face of adversity stands as an inspiring model for future generations of engineers. In light of this, we have launched the Marcelle-Gauvreau Engineering Research Chairs Program, which promotes equity and diversity by providing opportunities for individuals whose life experience demonstrates their exceptional ability to overcome obstacles – an essential quality in the pursuit of excellence and innovation.
OBJECTIVES

The objectives of the current Strategic Research Plan are inspired by the ÉTS vision that was established in the 2019-2022 Strategic Plan.

To become a university where the best talents in engineering unite to change, reimagine and invent the determining concepts for tomorrow’s society.

» To be a world leader known for the tangible impact of its research;

» To train future generations of researchers and highly qualified personnel striving to serve the common good;

» To foster open science and open innovation;

» To promote interdisciplinary and intersectoral approaches;

» To cultivate a spirit of entrepreneurship among researchers.
We have identified six areas of focus for meeting these objectives:

- Creating interdisciplinary research centres based on strategic themes to facilitate the emergence of global, creative and innovative solutions;
- Increasing support for ÉTS researchers to increase their presence in major structuring projects at the provincial, national and international level;
- Developing new research niches by creating research chairs;
- Developing research activities aimed at maintaining the excellence of academic programs and the ability to train future generations to meet the technological needs of society;
- Enhancing the professional proficiency of our graduates and postdoctoral fellows to equip them with the assets that will propel their careers to key research positions in organizations;
- Introducing conditions that enhance the attractiveness and distinctive character of ÉTS so that it remains a preferred research partner.
Humanity is facing major challenges, such as climate change, the availability of resources and the preservation of biodiversity, to name but a few. The field of engineering and technological developments will play a major role in creating a sustainable future. In addition, the complexity of these challenging issues requires that they be studied from every perspective through an interdisciplinary approach. Toward this end, researchers in engineering, health sciences and social sciences and humanities have combined forces into two research groups led by ÉTS in the interrelated fields of sustainable development and circular economy.

ÉTS is the host for an interuniversity strategic research cluster comprising 90 researchers and 200 students called the Interdisciplinary Centre for Research, Development and the Operationalization of Sustainable Development (CIRODD), which is funded by the FRQNT-FRQSC. The focus is to accelerate the transformation of society toward supporting the socio-environmental transition through sustainable innovation and transdisciplinarity. As such, CIRODD aims to catalyze, enlighten, advise, mobilize and support societal decision-makers and stakeholders in making decisions based on the best scientific knowledge and practices.

The Center for Intersectoral Studies and Research on the Circular Economy (CERIEC) provides a space for researchers and engineering students to conduct experiments, particularly in the area of innovations designed to maximize benefits for economic actors, governments and civil society. Certain priority sectors or business strategies will be deployed in “accelerated circular economy labs.” Based on the model of living labs, these labs are developed and managed via an ecosystem approach involving all stakeholders.

The Réseau de recherche en économie circulaire du Québec (RRECQ), led by four co-directors (ÉTS, HEC Montréal, Université Laval and Polytechnique Montréal), includes more than 100 researchers from some 20 establishments. It provides an environment that promotes the development of both social and technological knowledge and innovation and assumes the role of facilitator, promoting the networking, advancement and transfer of knowledge.

The combination of these areas of expertise will shed new light on a wide variety of subjects, from assessing and reducing greenhouse gas emissions to creating new approaches and technologies based on the circular
economy and designing more durable materials. Thanks to innovative approaches to action research, these groups are helping to accelerate the transition toward a circular economy and the social-environmental transformation of society.

Almost half the reductions required to achieve carbon neutrality by 2050 will come from technologies that are at the demonstration or prototype phase now.

International Energy Agency (IEA)
We have a reputation for the tangible impact of our research thanks to our world-class research infrastructure and equipment that allows for the advancement of knowledge in areas where innovation will play a key role in the society of the future. In keeping with this approach, we have invested more than $60 million over the past five years to further modernize our research laboratories and equipment.

In addition to providing a stimulating research environment, these advanced technologies and equipment are used to validate theories, characterize new materials and complex systems, build prototypes and test them in real environments. Some of the equipment reproduces industry processes at a smaller scale, which contributes to the fast and efficient transfer of our innovations. Finally, living laboratories allow the end user to be integrated into the heart of the innovation process, such that the technologies that are developed are well suited to the people for whom they were intended.
PROVIDING THE MEANS TO REALIZE OUR AMBITIONS

ADVANCED MATERIALS FOR A SUSTAINABLE FUTURE

Based on the concept of open laboratories that are accessible to both internal and external users, the research infrastructure for composite materials, advanced forming technologies, powder injection molding and high-strength alloy assembly is intended for the manufacturing of materials that will contribute to the green shift in the aeronautics, energy and biomedical industries. As such, this infrastructure incorporates the entire manufacturing chain and advanced characterization equipment, including field-emission electron microscopes with unique characteristics and a tomographic 3D material characterization imaging device.

INTELLIGENT CYBERNETIC VALUE CHAIN

Acting as a veritable virtually scalable factory model, this infrastructure connects the digital systems of partner educational institutions (ÉTS, UQAM, Polytechnique Montréal, Concordia University, Université Laval and Université de Sherbrooke, Cégep de Sherbrooke and John Abbott College) to the supply chain of a dozen Canadian manufacturing companies. This project makes it possible for a company to experimentally validate its various digital transformation strategies in a live environment. The technologies that are designed here incorporate cloud computing, artificial intelligence, robotics, human-machine interfaces and manufacturing through recycling.

CYBER-PHYSICAL SYSTEMS FOR DISTRIBUTED DIGITAL INTELLIGENCE

The research conducted by the Distributed Digital Intelligence Network (ÉTS, Université de Sherbrooke, McGill University, Concordia University and Université du Québec à Trois-Rivières) focuses on edge computing as an alternative to the current centralized model of artificial intelligence. The leading-edge infrastructure deployed by ÉTS since 2021 supports the design of embedded sensors, notably through the technology of printed and flexible electronics, edge data processing, communication technology and low-latency information transfer.

INFRASTRUCTURE FOR MOTION CAPTURE AND THE BIOMECHANICS OF SHOCK

This infrastructure allows for the multiscale characterization of materials and real-time simulation of articulated mechanisms and human motion. By combining numerous motion capture and analysis technologies, researchers can analyze human motion more accurately using fewer cameras and markers. This infrastructure is not only useful for the design of safety helmets and prostheses, for example, but also for the creation of virtual characters with movement that is sufficiently realistic to validate designs and concepts to be later used by humans.
ENTREPRENEURSHIP
CULTIVATING AUDACITY

“Created by ÉTS, Centech is a business incubator that has been recognized by UBI Global as being among the 10 best business incubators in the world.”

Photo credit: Stéphane Brügger
Puzzle Medical Devices was created during an entrepreneurship course at ÉTS in 2018. The device for which it has become famous, a minimally invasive heart pump, received its first approval from the US Food and Drug Administration (FDA) in January 2021. This success comes from the hard work of its three co-founders, two of whom are ÉTS graduates – one in Mechanical Engineering and the other in Robotics Engineering.

Investors from Canada, the United States and Europe have approached them, and a world-renowned interventional cardiologist has joined their team as Medical Chief. The heart pump conceived by the three young entrepreneurs is now a beacon of hope for some 26 million patients around the world who struggle with heart failure.

SPARK Microsystems is the result of a partnership between two electrical engineering professors/researchers at ÉTS. They combined their skills in radio-frequency circuits and integrated circuits to propose a novel approach that would revolutionize the world of signal transmission.

The high-performance wireless transceiver designed by SPARK Microsystems helps to extend battery life and achieve instantaneous and high-fidelity communications. Its efficiency, agility and robustness allow it to access a large number of markets, many of which are ill-served by current wireless technologies. In fact, the company was the winner of the 6th annual Nokia Open Innovation Challenge.

Founded in 2014 by ÉTS students, ARA Robotics was the first Canadian company to design an industrial-grade autopilot, which is like an electronic brain, for all types of lightweight drones. Using this autopilot, which was designed by applying the best practices of civil aviation, drones can be controlled remotely, improving their flight reliability and safety, while still allowing users to focus on data collection. The three founders of ARA Robotics, graduates from the Mechanical Engineering, IT Engineering and Electrical Engineering programs at ÉTS, met when they were members of Dronolab, one of our many student clubs.
We have identified four main societal issues that will determine our priority strategic orientations for the next five years.

01 CLIMATE ACTION

There is a consensus concerning climate urgency and the fact that the effects of climate change are now inevitable. Therefore, we must study, model and plan for these changes in order to adapt to them and become resilient. Solutions to the effects of climate change will be multifaceted: reductions at source, behavioural change, regulatory changes and evolving policies. Technology will be called upon to play a key role. In light of this, our goal is to revolutionize the approaches to sustainable industrialization, energy transition and circular economy in order to go beyond impact reduction and focus on creating value.

02 SECURITY AND ACCESSIBILITY

Efficient and reliable systems are required to ensure the security of humans and computer systems, not to mention food security and economic security. The right systems help to enhance our quality of life and ensure more equitable access to resources, such as drinking water in developing regions, digital and smart infrastructure in cities and telemedicine services in remote areas. We believe that technology can help to ensure a more equitable, friendlier and safer world at both the local and global scale.
Good health at every stage of life requires a holistic approach that includes not only treating illnesses, but also preventing them. To achieve this, health promotion strategies that target both the physical and psychological wellness of individuals must be deployed. Therefore, we must apply a wide range of engineering expertise and work closely with experts from diverse backgrounds in living laboratories to create the technologies of tomorrow.
AERONAUTICS AND AEROSPACE

Global competition, which is always more fierce in the aeronautics and aerospace sectors, is now more intense than ever due to environmental concerns. Many are placing a great deal of hope in the invention of green or environmentally friendly aircraft. Keenly aware of the issues and eager to enhance the competitiveness of the Canadian industry, our research teams contribute directly to the development of technologies intended to reduce the environmental footprint and increase the performance and reliability of aircraft.

We are pioneers in these sectors. The equipment deployed in our laboratories is at the cutting edge of technology, while our research teams work with the most prominent companies in the industry and play key roles in associations such as the Consortium for Research and Innovation in Aerospace of Québec (CRIAQ) and the Consortium for Aerospace Research and Innovation in Canada (CARIC).

Keywords: simulation and modelling, aerodynamics, propulsion, flight dynamics, avionics, flight simulator.

INTELLIGENT AND AUTONOMOUS SYSTEMS

Automation used to be the ultimate innovation in industry, but automated systems still relied on human intervention for configuration and supervision. In addition, it was sometimes difficult to get these systems to work in new contexts. Introducing intelligence into the machines that make up these autonomous systems enables them to maintain performance and the precision of operations they require, because they can detect, plan and act on their own, even in a changing environment. Applications are wide-ranging: autonomous transportation, computer-aided diagnosis, financial technologies, collaborative robotics, etc. These fields require both high-performance AI algorithms that can adapt to unpredictable situations and systems that can “sense” their environment and act upon it.

Keywords: data processing and management, robotics, machine learning, artificial intelligence, computer vision, modelling.
INNOVATIVE MATERIALS AND ADVANCED MANUFACTURING

Our research teams analyze, design, transform, produce and test technologies involving materials that can enhance their performance, durability, cost-effectiveness and capacity for upgrading in order to produce a positive impact on the environment.

These materials are more robust, more resistant, lighter, cleaner and more recyclable, and can be used to improve manufacturing-process equipment and in the manufacturing of finished products. A number of industrial sectors can benefit from these materials that are suited to sustainable development principles, especially transportation and health.

Our research teams are constantly striving to develop smart materials through the use of emerging technologies.

Keywords: composite materials, manufacturing processes, advanced manufacturing, Industry 4.0, 3D printing, materials characterization, printed electronics.

HEALTH TECHNOLOGIES

Health needs in Québec and Canada continue to increase, mostly due to an aging population, but also due to the influence of environmental factors and the emergence of new illnesses. In light of this, improving the availability and quality of health and wellness services is a critical issue, and we firmly believe that technology can be of service to this. Therefore, we have decided to prioritize the design of innovative technologies intended to improve wellness and quality of life and to prevent, screen and treat health problems. Constantly seeking to offer tangible solutions, our research teams work closely with industrial partners and clinical staff within hospitals.

Keywords: biomedical engineering, biomechanics, biomedical signal processing, medical imaging, personalized medicine, rehabilitation, health and safety, biomaterials, virtual sports training, injury prevention.

INFRASTRUCTURE AND THE BUILT ENVIRONMENT

Our research teams offer solutions aimed at modernizing the construction industry and erecting resilient and sustainable infrastructure assets and built environments. The solutions that they propose are designed to reduce environmental footprints, promote the well-being of communities, ensure the sustainability of engineering structures and enhance the productivity, performance and quality of construction and urban development projects.

Keywords: construction materials, intelligent buildings, construction methods, building information modeling (BIM), sustainable construction, smart city.
SOFTWARE SYSTEMS, MULTIMEDIA AND CYBERSECURITY

Digital tools, and software applications in particular, are omnipresent in our lives. Progress in this area is producing an ever-increasing range of solutions, from monitoring equipment and connected objects to interacting with machines or other humans, and even data processing and storage. With software applications having become so indispensable, it is critical that they are increasingly reliable and secure. Their carbon footprint is also significant, so their durability must be improved.

To achieve this, our research teams are working to improve the quality, security and reliability of software applications while reducing their environmental footprint.

In the areas of software engineering and information technology engineering, our teams have a reputation for implementing systems designed to create digital and interactive environments.

Keywords: Internet of Things, computer-aided design and manufacturing, human-machine interface, digital transformation, interactive cybersecurity, virtual and augmented reality, block chain, cloud computing, edge computing.

SUSTAINABLE DEVELOPMENT, CIRCULAR ECONOMY AND ENVIRONMENTAL ISSUES

The negative impact of human activity on the environment is well documented. This impact contributes to climate change, which affects economic activities, wellness and the safety of communities. One of our priorities is to find methods, tools and processes that can reduce these effects, along with ways to use resources in a sustainable and circular manner for the population in general, governments or universities.

At ÉTS, this issue is a particular focus of our interdisciplinary research teams, who are working to optimize the use of resources from the perspective of the circular economy: reducing waste matter, creating new water, air and soil treatment processes and promoting sustainable urban agriculture and development.

Keywords: construction materials, intelligent buildings, construction methods, building information modeling (BIM), sustainable construction, intelligent city.
SENSORS, NETWORKS AND CONNECTIVITY

With the proliferation of digital applications, connectivity has become an essential part of our lives. Businesses are no exception to this: many elements of the supply chain are now optimized through information and communication technologies (ICT), and hardware and software solutions are used to connect individuals and objects, all while facilitating innovation, creativity, the valorization of information, accessibility and cooperation.

Whether for the smart clothing industry, the infrastructure sector or the fields of health, urban agriculture or transportation, to name but a few uses, these robust, energy-autonomous sensors and their communication network infrastructure must be designed in such a way as to establish real-time diagnostics and enable corrective actions before problems arise or spread.

Keywords: communication networks, cyber-physical systems, digital signal processing, wireless communication, optical communication, Industry 4.0, microsystems, Internet of Things.

EMERGING FIELD: QUANTUM ENGINEERING

Technological advancements in microelectronics are largely responsible for the emergence of the digital society in which we currently live, but advancements in quantum mechanics will likely make these leading-edge technologies obsolete.

These new applications will revolutionize areas as varied as healthcare, national defence, communications and resource management to their very core. As such, we believe that the field of quantum engineering in Canada will generate investments in excess of $8 billion by 2030. Our research teams will be active participants in the development of this promising sector.

Keywords: quantum communication devices, programming and algorithms for quantum computers, cryptography, calculators.
Strategic Research Plan 2022-2027

Aeronautics and aerospace

Sustainable development, circular economy and environmental issues

Creatives and entertainment

Sensors, networks and connectivity

Financial services

Retail trade

Creative industries

Intelligent and autonomous systems

Innovative materials and advanced manufacturing

Emerging field: Quantum engineering

Software systems, multimedia and cybersecurity

Health and wellness

Health technologies

Infrastructure and the built environment

Agribusiness

Construction and infrastructure assets

Automation, collaborative robotics, and smart objects

Life sciences and health technologies

Information and communication technologies

Sustainable development and clean technologies

CLIMATE ACTION

CREATIVITY, COLLABORATION AND ENTREPRENEURSHIP

Change, reimagine, and invent the determining concepts for tomorrow’s society

SECURITY AND ACCESSIBILITY

HEALTH AND WELLNESS
Strategic Research Plan 2022-2027

Strategic research orientations

Strategic research fields

Stakeholder sectors and partners
EQUITY, DIVERSITY AND INCLUSION
SUPPORTING DIVERSE OPPORTUNITIES
Having contributed to the advancement of engineering and economic growth in Québec as a result of the unique university education it offers, ÉTS is fully convinced that diversity is an asset. In this regard, we believe that equity, diversity and inclusion (EDI) are essential ingredients in the pursuit of excellence in research and innovation. This is why we endorse the Dimensions Charter, which aims to promote research excellence, innovation and creativity in the post-secondary environment by integrating core EDI values.

We conducted a global consultation process involving our staff and faculty to take stock of the current situation and ascertain individual experiences related to inclusion.

After closely analyzing the recruitment processes, a number of objectives and actions were introduced to ensure that these processes are as equitable as possible. Training was provided to our professors and support staff to raise awareness of unconscious bias and the realities and rights of Indigenous peoples, and to welcome individuals from diverse backgrounds.

Equity, diversity and inclusion have now become essential to every aspect of our research projects, from the design and ideation phase to the composition of the research team as regards researchers and qualified support personnel alike.

The proportion of women in engineering has increased significantly over the past 30 years. Female engineers now represent 15% of all engineers in Québec, up from only 4% in 1989.

In acknowledging that increasing the proportion of women in engineering is an important issue, we have joined Engineers Canada’s ‘30 by 30’ initiative, which aims to raise the proportion of female engineers to 30% by the year 2030.

Thanks to the many initiatives that we have implemented internally and within the community, we believe that we can achieve this ambitious goal, which will ensure a sustainable shift in the engineering profession.
MEASURING OUR SUCCESS
Our Strategic Research Plan will serve as a guide for all institution-level decisions that could affect the development of research at ÉTS. The Research and Partnerships Directorate and the Office of the Dean of Research will oversee its implementation. The performance markers that will be used to assess our progress toward achieving our objectives are defined below. Quantifiable targets based on these markers will be determined and assessed annually.

TO BE A WORLD LEADER KNOWN FOR THE TANGIBLE IMPACT OF ITS RESEARCH.

- Prizes won by our researchers in national and international competitions
- Number and scope of research projects carried out in partnership
- Participation in international research networks
- Media coverage of our research achievements

TO TRAIN FUTURE GENERATIONS OF RESEARCHERS AND HIGHLY QUALIFIED PERSONNEL STRIVING TO SERVE THE COMMON GOOD.

- Placement rate and quality of jobs obtained by our graduate researchers and postdoctoral fellows
- Satisfaction rate among employers and graduates with respect to graduate and postgraduate education and postdoctoral fellowships

TO FOSTER OPEN SCIENCE AND INNOVATION.

- Percentage of open access publications
- Accessibility to open data sets resulting from research
- Initiatives bringing together actors from a given sector in view of advancing knowledge and sharing solutions developed for the benefit of all actors

TO PROMOTE INTERDISCIPLINARY AND INTERSECTORAL APPROACHES.

- Leadership in the creation of research centres based on interdisciplinary strategic research themes
- Novel framework for evaluating research excellence that values interdisciplinary achievements
- Hiring of professors and chairholders recognized for their impact in interdisciplinary research initiatives

TO CULTIVATE A SPIRIT OF ENTREPRENEURSHIP AMONG RESEARCHERS.

- Number and value of start-ups created from research and innovation
- Evaluation of our reputation for providing an environment that is conducive to entrepreneurship
CONCLUSION

At ÉTS, “doing research differently” means setting more loftier targets and taking the road less travelled, or even a brand new road, while building on our distinctive character and our strengths. Our strengths include the expertise of our research teams, the trust and close ties that we have forged over the years with our community and partners and the tangible positive results generated by our research activities.

We firmly believe that our strategic research orientations will enable us to enter into partnerships with a broader range of organizations, access new sources of knowledge and contribute to the great social changes of our time.
This Strategic Research Plan, prepared by a Steering Committee comprising members of the Office of the Dean of Research and the Office of the Director General at ÉTS, began with a literature review in 2020. A survey was then conducted among the ÉTS faculty in January 2021. This made it possible to assess the faculty’s level of adherence to the vision and values presented in the 2019-2022 ÉTS Strategic Plan, determine how research was defined and perceived within the university by those who conduct it on a daily basis and question researchers concerning the future of research in general, and within ÉTS in particular (opportunities, challenges, initiatives and preferred collaborations).

The consultation process continued during the spring of 2021 with a variety of meetings involving research chairholders, laboratory heads and various official bodies of ÉTS. Themed workshops involving our professors also delved deeper into issues and reflections. They were asked to express their views with respect to the broad strategic orientations and the fields of research proposed in the new Strategic Research Plan. Their invaluable feedback and suggestions helped to better define the research orientations and fields, and to explore other avenues. This made it possible to develop the various research fields and develop the upcoming action plan aimed at implementing the Strategic Research Plan.

Another survey was conducted among the faculty in September 2021 to verify their adherence to the reworked strategic orientations following the spring 2021 consultation process. The results of this survey revealed that 78% of faculty members are in favour of or strongly in favour of the four strategic orientations that have been established.

Before seeking final approval from the ÉTS Board of Governors, we consulted the members of the Management Committee, the Comité de coordination de l’enseignement et de la recherche (CCER – Teaching and research coordination committee) and several research partners, including the Canada Foundation for Innovation (CFI), the Natural Sciences and Engineering Research Council (NSERC), the Canadian Institutes of Health Research (CIHR), Canada Economic Development, the Ministère de l’Économie et de l’Innovation du Québec (Québec Ministry of Economy and Innovation), the Chief Science Advisor of Canada, Québec’s Chief Innovation Officer and the Chief Scientist of Québec.
APPENDIX 2

INCLUDING EDI IN THE RESEARCH VISION AND PRIORITIES OF ÉTS

At ÉTS, we believe that everyone has the right to equal opportunities, regardless of the colour of their skin, or their gender, ethnic background or disability status. As such, we make every effort to foster conditions that promote professional development. We create inclusive research environments and form collaborations with partners from diverse backgrounds. A number of measures have been adopted and a variety of actions have been implemented to ensure that the principles of EDI are respected during the recruitment of faculty and the allocation of research chairs.

On the other hand, we recognize that there is still a great deal of work to be done to ensure accessibility to persons with disabilities and members of First Nations and the LGBTQ2+ community. We have made a commitment to implement actions aimed at ensuring the participation of these groups within our research teams. Some of these actions are listed here:

- We will soon be conducting an analysis of the current context to make the workplace more welcoming to transgender individuals or nursing mothers, for example.
- We will be conducting a survey of our spaces to evaluate their accessibility for persons with disabilities.
- We will make efforts to integrate Indigenous people within our classes and research teams.
- We will implement appropriate means to better include issues related to Indigenous people and persons with disabilities in our research projects.

Our job postings are now inclusive, and are circulated in such a way as to reach a diversified pool of candidates. Members of the selection committees have been trained to recognize unconscious bias, and will have the support of a person in charge of ensuring that the process is free of bias. In addition, researchers at ÉTS receive regular training on topics related to EDI, and are encouraged to participate in efforts to develop a diversified next generation of engineers by adopting sustainable practices when recruiting students and graduate and postgraduate interns.
ÉTS created the Marcelle-Gauvreau Engineering Research Chairs Program, which is intended for researchers who have overcome personal and professional hardships over the course of their career. We believe that this program will provide the support these individuals need to reach their full research potential.

We have also implemented a follow-up program to encourage students at the doctoral and postdoctoral level to apply for research positions at ÉTS. This program is specifically intended for talented individuals from under-represented groups.

When the last collective agreement was signed with professors, working in collaboration with the union, we integrated a provision that allows individuals returning to work after a parental leave of more than five months to reduce their teaching workload.

Although we are still far below the 30% target set by Engineers Canada, we still manage to increase female representation among our teaching staff year after year.

In addition, we are particularly proud of the representativeness of persons from ethnic backgrounds, who are strongly represented among our ranks.
## APPENDIX 3

### FORECASTING THE ALLOCATION OF CANADA RESEARCH CHAIRS

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<th>STRATEGIC RESEARCH FIELDS</th>
<th>CURRENT</th>
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<td>Aeronautics and aerospace</td>
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<td>Intelligent and autonomous systems</td>
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<td>2</td>
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<td>Health technologies</td>
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<td>2</td>
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<td>Innovative materials and advanced manufacturing</td>
<td>2</td>
<td>2</td>
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<td>Infrastructure and the built environment</td>
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<td>2</td>
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<tr>
<td>Software systems, multimedia and cybersecurity</td>
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<td>Sustainable development, circular economy and environmental issues</td>
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DOING RESEARCH DIFFERENTLY
STRATEGIC RESEARCH PLAN
2022-2027

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