Chapter 22
Saskatchewan Polytechnic—Carrying Out Applied Research

1.0 MAIN POINTS

Since 2014, Saskatchewan Polytechnic (Sask Polytech) has had a goal to grow its applied research. Applied research focuses on providing practical solutions to specific problems of individuals or organizations.[1] Its applied research revenues quadrupled from 2014 to 2019 to $3.6 million in 2018-19; these revenues represent about 1% of Sask Polytech's 2018-19 total revenues.

In 2019 and early 2020, Sask Polytech generally used effective processes to carry out applied research. We make five recommendations for improvement. For example, Sask Polytech needs to:

➢ Always document, for all types of applied research projects, its assessment of the viability of and key risks associated with potential projects before pursuing a project.

   Our testing found for projects where Sask Polytech does not complete an application for funding, it does not document its assessment of a project's viability or associated key risks.

   Formally documenting assessments of viability and key risks reduces the risk of missing key evaluative aspects of potential projects and undertaking projects it cannot successfully complete.

➢ Confirm all staff and students involved in applied research projects reaffirm their commitment to the Code of Conduct at least annually.

   Our testing found faculty and students involved in research projects did not always annually acknowledge compliance with Sask Polytech's Code of Conduct Policies because of the way Sask Polytech requested these acknowledgments. Our testing found instances where the most recent acknowledgements ranged from just over a year ago to 11 years ago.

   Annual acknowledgements remind staff and students of acceptable business practices and the need to consider and declare conflicts of interest. Demonstrating compliance with policies helps show Sask Polytech researchers understand and accept responsibilities for carrying out research.

Furthermore, to better support future growth in applied research, Sask Polytech needs measures to assess the success of its applied research beyond annual growth in research revenue, and to keep more robust, up-to-date project information to improve its ability to track a larger number of projects.

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[1] saskpolytech.ca/about/applied-research-and-innovation/ (20 April 2020).

2.0 INTRODUCTION

2.1 Responsibility for and Focus of Applied Research

Since 2014, Sask Polytech has identified applied research as a key area of focus.[2] Its goal is to grow applied research by leveraging its expertise in generating practical solutions for industry problems.[3] Sask Polytech aims to have its applied research support Saskatchewan's productivity and economic prosperity, enable the organization to keep current with industry needs, and provide opportunities for students to enhance their learning experience.[4]

As outlined in **Figure 1**, Sask Polytech focuses its applied research activities and expertise within five centres. These centres are to help industry partners refine and deliver solutions to their questions, build product prototypes (e.g., bio plastics, use of 3D printers), and provide testing.[5]

Figure 1—Focus of Saskatchewan Polytechnic's Applied Research

> **Digital Integration Centre of Excellence**
> ➢ Is a research lab Sask Polytech uses to work collaboratively with multiple programs to bring digital solutions to various industry partners
> ➢ Focuses on data—data integrity, transmission, analysis, and storage
>
> **Innovative Manufacturing Centre**
> ➢ Involves collaboration between Sask Polytech, industry and employers to provide students with a broad knowledge and skill-set in manufacturing
> ➢ Provides industry partners with access to the latest tools, equipment and expertise to improve production methods and test new ideas and products
> ➢ Includes facilities for: biomaterials testing and prototyping; research, additive manufacturing and prototyping; robotics; and mechatronics
>
> **BioScience Applied Research Centre**
> ➢ Offers industry experts access to applied research expertise to discover solutions to everyday problems
> ➢ Strengths include: agricultural bioscience; analytical chemistry; analytical instrumentation; biochemistry microbiology; and molecular biology
>
> **Hannin Creek Education and Applied Research Centre**
> ➢ Is an educational facility north of Prince Albert on the shores of Candle Lake
> ➢ In partnership with the Saskatchewan Wildlife Federation, HCEARC provides industry experts and students with unique hands-on learning opportunities in forestry, fisheries, wildlife, conservation law, recreation and environmental, civil and water resources technologies
>
> **Centre for Health Research, Improvement and Scholarship**
> ➢ Supports faculty in Sask Polytech's Schools of Health Sciences and Nursing in achieving their scholarly development goals and aspirations
> ➢ Provides faculty with access to support for publication and presenting, grant and funding applications, and request in-service sessions on a variety of scholarly topics
> ➢ Serves as a hub for research networking and allows faculty to connect with potential research partners within the Sask Polytech community and beyond

Source: Adapted from www.saskpolytech.ca/about/applied-research-and-innovation/industry.aspx (1 May 2020).

Sask Polytech makes its Office of Applied Research and Innovation (Research Office) responsible for managing its applied research. Its responsibilities include managing the

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[2] *The Saskatchewan Polytechnic Act* (s. 4, 16) gives Sask Polytech authority to provide applied research to governments, corporations, or other third parties, and enter into agreements for the purpose of performing applied research.
[3] Saskatchewan Polytechnic, *Multi-year Business Plan 2018-2021*, p. 18.
[4] Ibid.
[5] Industry partners are companies that choose to partner with Sask Polytech in an applied research project.

administrative aspects, facilitating development and interpretation of policies and guidelines, and distributing information about funding programs and other opportunities.[6] It is comprised of staff in about six full-time equivalent positions.

Faculty located at each of Sask Polytech's four campuses carry out applied research.[7,8] The Deans of each of its academic schools (e.g., School of Natural Resources and Built Environment, School of Mining, Energy and Manufacturing) assign research responsibilities to specific faculty members. Also, students may participate in applied research projects as temporary staff or through research scholarships. During the 12-month period ended January 2020, about 20 faculty members and almost 100 students were involved in applied research activities.

As illustrated in **Figure 2**, Sask Polytech has quadrupled its total applied research funding over the last five years. It has grown from $642,000 in 2014-15 (of which 60% was from externally funded projects) to $2.6 million in 2018-19 (of which 56% was from externally funded projects).[9]

Most of Sask Polytech's external research funding comes from federal research funding agencies (e.g., Natural Sciences and Engineering Research Council, Western Economic Diversification Canada). External research projects may be funded by research funding agencies, industry partners, or a combination.

Figure 2—Saskatchewan Polytechnic Applied Research Funding 2014–15 to 2019–20
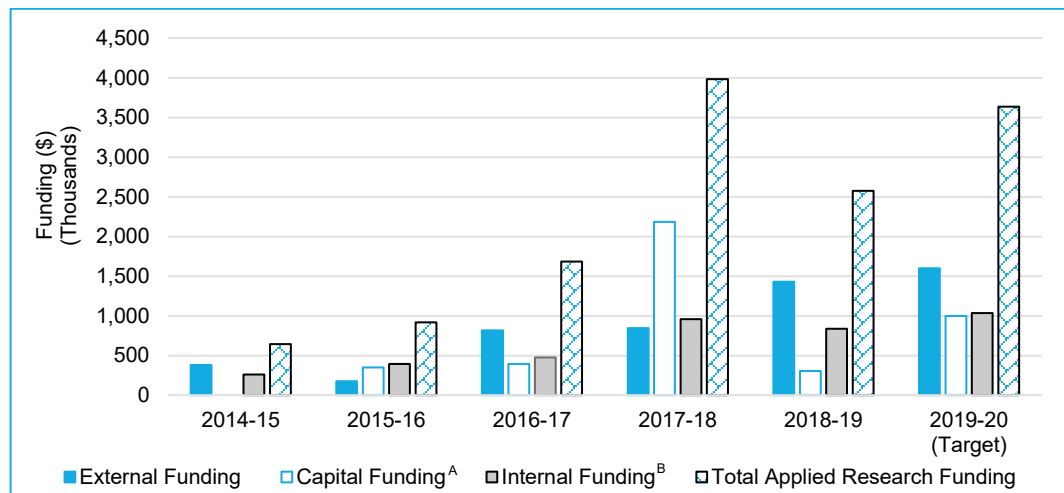
Source: Adapted from information provided by Saskatchewan Polytechnic.
[A] Capital funding is funding specifically for the purchase of equipment or facility renovation/improvement. Sask Polytech receives capital funding almost exclusively from federal granting agencies.
[B] Internal funding refers to projects Sask Polytech finances through its own resources.

Effective applied research processes can assist research organizations with having their projects stand up to scrutiny, making suitable resources (e.g., people, equipment) available, and appropriately monitoring project budgets and timelines.[10] Such processes

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[6] Saskatchewan Polytechnic, *Applied Research and Scholarship Action Plan 2015-2020*, p. 9.
[7] Unlike universities where faculty are hired to teach and carry out research, Sask Polytech hires its faculty solely to teach. Also, it places less emphasis than universities on publishing the results of research.
[8] Sask Polytech has campuses in Moose Jaw, Prince Albert, Regina, and Saskatoon.
[9] Outside agencies fund external projects; whereas Sask Polytech self-funds internal projects.
[10] *Report of the Auditor General of Canada – November 1999, Chapter 22, Attributes of Well-Managed Research Organizations*, p. 22-26.

support making informed decisions, maintains the financial viability of research activities, and helps protect Sask Polytech's reputation with industry partners and funding agencies.

Well-managed research organizations are widely known and respected—stakeholders view the organization as performing an essential service, is responsive to their needs, is reliable, demonstrates flexibility, and is service-oriented.[11] Not assisting its stakeholders (e.g., businesses, industries, communities) in meeting their needs can negatively impact Sask Polytech's reputation as an applied research partner. In addition, ineffectively applied research processes may not enable Sask Polytech to fully realize potential benefits of the learning opportunities this makes available to its students.

3.0 AUDIT CONCLUSION

We concluded Saskatchewan Polytechnic had, other than the following areas, effective processes, for the 12-month period ended January 31, 2020, to carry out applied research.

Saskatchewan Polytechnic needs to:

➢ **Establish written guidance on requiring funding agreements with industry partners involved in applied research projects**

➢ **Confirm staff and students involved in applied research projects identify and report potential conflicts of interest as its policies expect**

➢ **Always document its assessment of the viability and associated key risks of potential external applied research projects before pursuing a project**

As Saskatchewan Polytechnic works towards achieving its goal of growing applied research and has an increasing number of applied research projects, it needs to:

➢ **Maintain up-to-date project information (e.g., project status, project dates, ethics approvals) to improve its ability to track projects**

➢ **Broaden measures it uses to assess the success of the applied research initiative beyond its current measure of growth in annual research revenue**

Figure 3—Audit Objective, Criteria, and Approach

Audit Objective: The objective of this audit is to assess whether Saskatchewan Polytechnic has effective processes, for the 12-month period ended January 31, 2020, to carry out applied research.

Audit Criteria: Processes to:

1. **Establish a strategy for guiding applied research**
   1.1 Establish plan with measurable objectives for applied research activities
   1.2 Define clear responsibilities for applied research (e.g., organization-level, project level)
   1.3 Maintain key policies to support implementation of plan (e.g., conflict of interest, code of conduct, intellectual property, project management, delegation of authority)

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[11] *Report of the Auditor General of Canada – November 1999, Chapter 22, Attributes of Well-Managed Research Organizations*, p. 22-30.

2. **Make informed decisions when undertaking applied research**
   2.1 Assess potential projects
   2.2 Estimate resources necessary to carry out projects (e.g., tools, training, expertise)
   2.3 Evaluate risks associated with and costs/benefits of projects
   2.4 Approve prioritized projects (e.g., enter into research agreements)
   2.5 Monitor approved budgets and deliverables for accepted projects

3. **Evaluate results of applied research**
   3.1 Maintain inventory of applied research projects (e.g., ongoing research, potential projects, agreements, intellectual property)
   3.2 Periodically evaluate performance of applied research by project and overall (e.g., compliance with policies and agreements, comparison to measurable objectives)
   3.3 Report status and progress of applied research to senior management and the Board

Audit Approach: To conduct this audit, we followed the standards for assurance engagements published in the *CPA Canada Handbook—Assurance* (CSAE 3001). To evaluate Sask Polytech's processes, we used the above criteria based on our related work, reviews of literature including reports of other auditors, and consultations with management. Sask Polytech's management agreed with the above criteria. We examined Sask Polytech's criteria, policies, and procedures relating to carrying out applied research. We interviewed staff responsible for applied research. We examined applied research documentation (e.g., policies, plans, applications for research funding). To assess the operating effectiveness of Sask Polytech's processes, we tested a sample of research projects, including review of project applications, agreements, correspondence, reports, and budgets.

4.0 KEY FINDINGS AND RECOMMENDATIONS

4.1 Applied Research Measures Established But Focus on Revenue Generation

Sask Polytech established measures to evaluate the achievement of its applied research objectives, though the measures primarily focus on generating research revenues and do not consider other measures of performance such as quality.

Sask Polytech's strategic plan (i.e., *Tomorrow in the Making—Strategic Plan 2014-2020*) and multi-year business plan (i.e., *Saskatchewan Polytechnic Multi-year Business Plan 2018-2021*) each include the goal specific to applied research—*Grow applied research*.[12,13,14]

Both plans include measures of success to evaluate achievement of the applied research goal. As noted below, these measures primarily focus on generating research revenues:

➢ The number and dollar value of external applied research grants each year.

➢ Annual growth in applied research revenues. Revenues include those from external sources to fund projects and related capital (e.g., equipment), and those Sask Polytech allocates each year from its other resources (such as grants from the Ministry of Advanced Education)—it refers to these as internal contributions.

Sask Polytech established a revenue growth target of 5% for 2018-19 and 41% for 2019-20.

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[12] The strategic plan sets the long-term direction for the organization and guides the development of the multi-year business plan.
[13] *Saskatchewan Polytechnic Multi-year Business Plan 2018-2021* identifies Sask Polytech's priorities, strategic initiatives, and resource allocations for three years.
[14] Sask Polytech's Board of Directors approved the strategic plan and multi-year business plans in May 2014 and May 2018, respectively.

We found Sask Polytech did not establish success measures about the quality of its applied research (e.g., rate of satisfaction of organizations to whom Sask Polytech provides research) or its rate of success in securing research grant applications—as good practice suggests.

Securing research projects (e.g., applying for grants) takes time and resources. Sask Polytech applies to federal and/or provincial granting bodies for about two-thirds of its applied research project funding. While Sask Polytech tracks the number of grant applications approved, we found it does not formally determine its success in securing these grants, or in securing other applied research projects.

Use of measures other than those that focus on revenue generation can assist Sask Polytech in evaluating its processes to secure applied research projects, and in providing its stakeholders with the best research products possible.

Some research organizations use ongoing and periodic reviews of projects and programs to measure progress toward providing relevant, timely, and significant expertise and research findings to their stakeholders.[15] Measurement of the quality of applied research can reduce risks to an organization's reputation and improve its ability to generate applied research funding in the future. Assessments of research quality can also provide insight into the need for additional training, coaching, or process improvement.

1. **We recommend Saskatchewan Polytechnic broaden the measures used to assess the success of its applied research beyond annual growth in research revenue.**

Management indicated that it has considered obtaining feedback from its industry partners to help assess the quality of its research.

4.2 Well-defined Responsibility for Operationalizing Applied Research Goal

Sask Polytech has clearly assigned responsibility for operationalizing its applied research.

The Research Office is responsible for operationalizing the research goal. It is to facilitate and promote applied research to faculty and industry, educate and mentor faculty about processes to identify potential applied research projects, and secure research contracts and funding.

In addition, the Associate Vice-President, Applied Research and Innovation is to work with the Vice-President, Advancement & International to establish the applied research targets included within the multi-year business plan.

Sask Polytech uses job descriptions (e.g., Director, Applied Research and Innovation) or job postings (e.g., Research Project Coordinator) to assign responsibilities to positions related to applied research.

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[15] Auditor General of Canada, *Report of the Auditor General of Canada to the Board of Governors of the International Development Research Centre*, (2016), p. 33.

Our review of the content of three job descriptions and three job postings relevant to expanding and coordinating applied research found each clearly established the associated duties and responsibilities. Sask Polytech gives applicants the job descriptions when they apply and makes them available upon request.

We found Sask Polytech used its process for evaluating staff performance (i.e., Personal Management Plans) to hold staff accountable for assigned responsibilities. We reviewed the Personal Management Plan for the Associate Vice-President, Applied Research and Innovation, and found it included personal objectives relevant to the position (e.g., development of applied research policies, development and submission of research applications).

Having well-defined responsibilities increases the likelihood of Sask Polytech achieving its research goal.

4.3 Reporting on Applied Research Appropriate

Sask Polytech's applied research reporting practices are comparable with good practice and appropriate given Sask Polytech's relatively early stage of growing applied research.

Research Office staff use various processes to advise senior management and the Board about Sask Polytech's applied research activities.

Given its focus on growing research and the modest number of applied research projects each year, staff within the Research Office, along with its Associate Vice-President, Director and Research Support Coordinator, are closely involved in managing the Office's operations on an ongoing basis. All Research Office staff and key researchers meet monthly to discuss ongoing research activities.

For the two months we tested, Research Office management and key researchers received written information about research applications, potential funding partners, scholarships awarded, and the status of projects. Also, for these two months, the Associate Vice-President received information about the primary success measure—growth in research revenues.

Each month, Sask Polytech's Senior Academic Leadership Team receives reports about the progress of applied research initiatives.[16]

For the two months we tested, reports to the Leadership Team included the status of applied research applications (e.g., approved, new, unsuccessful), and the amount of research revenues generated year-to-date.

Also, Sask Polytech's 2018-19 Annual Report reported the number of applied research projects and related revenue—68 external research projects (2017-18: 49 projects) and $1.7 million in external research revenue (2017-18: $3.0 million).

In addition in November 2019, Sask Polytech reported to the Board the 2018-19 results of the applied research measure set out in its multi-year business plan. Sask Polytech

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[16] Sask Polytech's senior academic leadership team is comprised of staff delegated responsibility by the Provost and Vice President, Academic for input on strategic matters—including new program implementation and new initiatives.

reported a 35% decrease in research revenue in 2018-19 compared to its target increase of 5%. Sask Polytech's decrease in research revenue in 2018-19 was largely related to the fact that its research revenues in the prior year included two large capital research projects that did not continue into 2018-19.

Reporting information about applied research activities to researchers, senior management, and the Board keeps them informed of the status of the applied research initiative, and demonstrates accountability of the Research Office for achieving Sask Polytech's applied research objectives.

4.4   Research Policies in Place

Sask Polytech's policies applicable to applied research are consistent with good practice.

Sask Polytech has a well-defined process to keep its policies up-to-date and appropriately approved. Its policy and procedures governing policy development and administration establishes a schedule for periodic review and approval of established policies. For example, policies requiring Board approval must be reviewed every three years, and policies requiring approval from the President and Chief Executive Officer must be reviewed every five years.

Three of Sask Polytech's general policies address areas significant to applied research (e.g., authority of management to sign applied research contracts, code of conduct). As well, six policies outline requirements specific to applied research activities. See **Figure 4** for a brief description of each policy.

Sask Polytech makes policies available to staff on its website, and advises them of changes via email. Also, each year, it requires staff and students to acknowledge in writing they have read and understand its policies.

Figure 4—Saskatchewan Polytechnic Policies Applicable to Applied Research

General Policies:

➢ Code of Conduct—sets out Sask Polytech's core values, core competencies, and principles of conduct. The policy requires all staff to reaffirm their personal commitment to the Code of Conduct and other core policies (e.g., harassment, appropriate use of IT) on an annual basis through acknowledgement of an electronic reminder that appears on their computer workstation. The policy also requires staff to familiarize themselves with all policies.

➢ Conflict of Interest—assists staff in identifying potential areas of conflict, and provides a procedure by which staff and the organization can disclose and manage conflicts.

➢ Management Authorities Grid—establishes the level of authority for members of management to approve various actions, including the approval of research agreements. The established authorities for approval of research agreements range from $500,000 for Directors and Associate Deans to $5 million for the President and Chief Executive Officer—though all levels of authority require consultation with Research Office staff prior to approving a research agreement.

Policies Specific to Applied Research:

➢ Applied Research Integrity Policy and Procedure Statement—addresses responsibility and accountability and advances a high standard of integrity in research and scholarship.

➢ Ethics of Research Involving Human Participants Policy and Procedures—sets out requirements to assist in meeting the requirements of major granting agencies and regulatory bodies and that appropriate safeguards are provided for human participants. The policy requires all research involving living human participants to obtain approval from the Research Ethics Board prior to research commencing.

> ➤ Inventions and Technology Transfer Policy—encourages the advancement of research; disclosure, evaluation and, if appropriate, protection of inventions and research discoveries made by faculty, staff, and students; and the transfer of technology to partners and ultimately the commercialization of Sask Polytech inventions and research discoveries.
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> ➤ Recovery of Indirect Costs of Applied Research Policy and Procedures—sets out principles for the recovery of indirect costs (i.e., overhead) of applied research and establishes a minimum indirect cost recovery rate of 20% of the direct costs.
>
> ➤ Applied Research Administration—provides guidance for the development, approval, and administration of applied research projects (e.g., preparation of project proposals and budgets, administration of research agreements, responsibilities of staff involved with research).
>
> ➤ Use of Animals in Teaching and Research—establishes an institution-wide program for the use of animals in teaching and research that meets Canadian standards for animal ethics and care.

Source: Adapted from www.saskpolytech.ca/about/about-us/policies-procedures.aspx (28 April 2020).

We found Sask Polytech did not review two policies consistent with its established review schedule. Under its schedule, it should have reviewed the Ethics of Research Involving Human Participants Policy in March 2017, and Applied Research Integrity Policy in May 2019. We found the content of these policies reasonable. Management reviewed and revised these policies in May 2020.

Our review of the policies listed in **Figure 4** found their content appropriate and consistent with good practices other than the Conflict of Interest Policy. It did not address processes for handling identified conflicts of interest, nor specifically include procedures to eliminate, minimize or otherwise manage conflicts of interest that may affect research as expected by the Tri-Council.[17,18,19] In May 2020, management revised the Applied Research Integrity Policy. We found the revised policy includes sufficient guidance over handling and addressing conflicts of interest.

Having written and up-to-date policies and procedures provide staff with key direction and help maintain knowledge in the event of staff turnover. By enhancing its Applied Research Integrity Policy to include guidance on handling conflicts to align with the expectations of the Tri-Council, Sask Polytech provides staff clear guidance on how to address situations where conflicts of interest may be present. Having clear guidance increases the likelihood of staff and students involved in Tri-Council-funded projects complying with the Council's requirements. Not always complying with Tri-Council requirements could place Sask Polytech at risk of not securing future grants from the Council.

Sask Polytech maintains a template with standard wording for non-disclosure agreements with industry partners. While not specifically addressed in a policy, Sask Polytech signs non-disclosure agreements upon request by its industry partners. Its partners may request such agreements when they provide Sask Polytech with details about existing products for conducting applied research.

Our assessment of Sask Polytech's template for non-disclosure agreements found it included key aspects (e.g., identification of parties, defining information which is

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[17] The Conflict of Interest Policy appropriately addressed some key areas (e.g., scope, guiding principles, potential conflicts of interest).
[18] The Tri-Council is comprised of the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Social Sciences and Humanities Research Council (SSHRC). They are a major source of research funding for post-secondary institutions across Canada. www.mcgill.ca/research/ran-welcome/tri-agency-administration (28 April 2020).
[19] *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*, Article 7.1, p. 93.

confidential, term, and scope of the confidentiality obligation) for such agreements when compared to good practice.

For two of 19 applied research projects we tested, Sask Polytech signed appropriately worded non-disclosure agreements upon request by an industry partner.

The signing of non-disclosure agreements upon request by industry partners enables Sask Polytech to demonstrate its commitment to help protect its partners' confidential and proprietary information.

4.5 Receipt of Annual Code of Conduct Acknowledgement Not Sufficiently Monitored

Sask Polytech does not actively monitor whether staff or students have acknowledged the annual code of conduct policy reminder, nor whether special circumstances exist where staff may not have received the reminder.

Each year, Sask Polytech sends an annual reminder to staff and students to electronically complete the requirement of reaffirming their commitment to the Code of Conduct Policy (annual acknowledgement).

For 19 applied research projects we tested (i.e., 10 external; nine internal), four faculty and five students involved in these projects had not completed the acknowledgement within the last year. The most recent acknowledgements ranged from just over a year ago to 11 years ago. For these projects, Research Office management noted they were unaware of any potential conflicts of interest associated with the projects.

Our further work found faculty and staff do not receive the annual reminder if they use their own computing devices (e.g., laptops), use MAC devices, or work on a network that they separately maintain from Sask Polytech's network.

Annual acknowledgement of the Code of Conduct Policy provides staff and students with reminders of acceptable business practices and the need to consider whether they have any conflicts of interest to disclose.

> 2. **We recommend Saskatchewan Polytechnic confirm staff and students reaffirm their commitment to the Code of Conduct at least annually, as required by policy.**

Management told us they hope to implement a solution to help monitor the receipt of annual acknowledgements from all staff by September 2020.

For 19 applied research projects we tested (i.e., 10 external; nine internal), staff followed Sask Polytech's policies specific to research. For example, for one internal research project we tested, Sask Polytech obtained approval from its Research Ethics Board as expected (i.e., research involved human participants).[20]

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[20] Sask Polytech utilizes the University of Saskatchewan Research Ethics Board when research involves the use of human participants.

Staff compliance with research policies helps Sask Polytech complete research projects in accordance with established expectations—doing so can contribute towards Sask Polytech developing a reputation for providing quality research.

4.6 Some Potential External Applied Research Projects Informally Evaluated

Sask Polytech uses well-defined processes to evaluate risks and feasibility of potential projects financed through federal research funding or internal funding. Whereas, its processes to evaluate other types of externally funded potential projects are less formal.

To initiate applied research projects, the Research Office monitors and typically responds to an expressed need from for-profit and non-profit organizations, research granting institutions (e.g., NSERC), or its faculty. We observed examples of the Research Office contacting Deans and faculty members to inform them of potential applied research opportunities. The Research Office uses an email distribution system to communicate with faculty involved in research.

When evaluating whether to pursue a potential applied research project, Sask Polytech considers the following risks:

➢ Capacity risk—its capacity to do the research (e.g., does it have the necessary technical knowledge, can it meet the project deadline)

➢ Reputational risk—whether the scope and purpose of the project fit with Sask Polytech's values (e.g., respect, integrity)

➢ Financial viability risk—whether expected revenue will be sufficient to cover expected costs including related overhead costs and whether funder will be able to pay

➢ Financial risk—whether ongoing costs (e.g., equipment maintenance, facility space) will exist and who will pay for them

At January 2020, management indicated Sask Polytech does not need to prioritize potential applied research projects, as it has not yet reached its capacity for performing research—it accepts all research projects that it considers viable. We found this approach was justified given Sask Polytech's current focus on growing its applied research activities.

For each of its internally-financed **Seed Applied Research Project** (SARP) and **Sustainability Initiative Fund** (SIF) programs, the Research Office has developed standard eligibility criteria and applications.[21,22] To access these funds, typically March of each year, researchers (faculty or students) must submit completed applications to the Research Office. The Research Office confirms applications meet specific program guidelines (e.g., relevance to Sask Polytech's goals, promote corporate social responsibility or environmental sustainability) before submitting applications to an internal review committee.

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[21] The SARP program provides funding support with the purpose of encouraging and supporting faculty members' interests in applied research and scholarly activities. Each year, the SARP program provides researchers with six awards of up to $6,000 each.

[22] The SIF program provides funding support to selected projects that will contribute to bridging sustainable development challenges with practical and innovative solutions. Each year, the SIF program provides researchers with three awards of up to $6,000 each.

The internal review committee is comprised of members nominated by Deans of the various schools within Sask Polytech. The Committee assesses the applications using a standard assessment worksheet, and recommends applications for funding to the Associate Vice-President, Applied Research and Innovation for final approval. During the 12-month period ending January 30, 2020, Sask Polytech had 18 internally financed projects ongoing for these programs, totalling $108,000.

For internally financed applied research projects conducted through its **School of Nursing**, and **Centre for Health Research, Improvement and Scholarship**, the School of Nursing oversees these projects. It has developed standard eligibility criteria and applications. Management of the School reviews applications, and recommends applications for funding for the Dean's final approval. During the 12-month period ending January 30, 2020, the School of Nursing had 23 internally financed projects ongoing, totalling almost $100,000.

For internally financed **student scholarships** for conducting applied research projects, Sask Polytech sets out scholarship requirements on its website.[23] Faculty members provide the Research Office with letters recommending specific students for scholarship to assist in assessing the potential projects. The Research Office reviews recommendations and makes decisions based on whether project proposals meets requirements. During the 12-month period ending January 30, 2020, the Research Office approved 46 internally financed student scholarships at $1,000 each.

We found that the standard applications Sask Polytech uses for its internally financed applied research projects capture sufficient key detail to determine project risks (e.g., project eligibility, viability, expertise of lead researcher, potential risks, and ethics requirements).

For each of the nine internally funded applied research projects we tested, the project file showed Sask Polytech sufficiently considered the associated risks based on information documented through various means (e.g., project applications, letters of recommendation from faculty for student scholarships).

For **federally funded** applied research projects, each federal funding agency requires the completion and submission of their standard project applications within prescribed deadlines. The Research Office works directly with the researchers to prepare and submit applications before the deadline. During the 12-month period ending January 30, 2020, Sask Polytech submitted 28 applications for federally funded projects and was successful in securing funding for 21 projects totalling about $750,000.

We found the standard applications of the federal granting agencies capture sufficient key detail to enable Sask Polytech to determine project risks.

For all six externally funded applied research projects we tested that required completion of an application, Sask Polytech documented its assessment of risks and capability to complete the project as part of completing the funding agency's standard project application.

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[23] www.saskpolytech.ca/about/applied-research-and-innovation/students.aspx (29 April 2020).

For other externally funded applied research projects, the requirements to obtain the funding vary with some requiring applications (e.g., Sask Lotteries), whereas for others (like industry), the Research Office, along with the potential researcher, work with the organization to determine its research needs and Sask Polytech's ability to meet those needs, and when. During the 12-month period ending January 30, 2020, Sask Polytech had 15 other externally funded projects ongoing, with total funding of almost $1.5 million.

For all four external projects we tested not requiring the completion of an application, Sask Polytech did not document its consideration of risks within the project file. Our discussions with the assigned researchers and staff from the Research Office found it had informally considered the risks associated with these projects.

Also, for three of those four projects, Sask Polytech did not document an assessment of its ability to complete the projects (e.g., whether it had appropriate expertise to do the project). Our discussions with the assigned researchers found they had a good understanding of Sask Polytech's ability to complete the assigned projects.

Not formally documenting the evaluation of the viability of all potential externally funded applied research projects increases the risk of missing key evaluative aspects of potential projects. This could result in Sask Polytech undertaking projects that it cannot complete.

Use of informal processes may work with a small number of total researchers and a high level of involvement of the Research Office. However, Sask Polytech's strategy is to grow its applied research activities. Growth in research activities increases the risk of the Research Office not being able to maintain the same level of involvement and to recall the basis of decisions about project viability and acceptance.

> 3. **We recommend Saskatchewan Polytechnic always document its assessment of the associated key risks of externally funded applied research projects prior to deciding to pursue the project.**

4.7 Project Plans Consistently Established

Sask Polytech consistently establishes project plans (e.g., budgets, deliverables, timeframes) for each of its applied research projects.

To establish budgets for applied research projects, the Research Office's budget officers work with researchers to estimate expected project costs. It does this when applying for funding or pursuing applied research projects.

The Office requires expected costs (budgets) of externally funded applied research projects to take into account the estimated costs of removing faculty from their teaching responsibilities for the expected duration of the project and costs associated with required equipment, training, travel, and assistance provided by students.[24] In addition, project plans must incorporate requirements of the funding agencies. For example, a funding agency may require an industry partner to match its funding. In such cases, the Research Office staff work with the industry partner to make them aware of the funding requirements (e.g., required cash or in-kind contributions).

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[24] Unlike universities, which hire faculty with the intention they will be involved in both teaching and research, Sask Polytech hires faculty with the sole intention of teaching.

For internally financed projects, the budget equals the funding made available to researchers for the particular research project (e.g., SARP, SIF, student scholarship).

The Research Office includes the final project budgets, along with associated project deliverables and timeframes, within applications submitted to federal funding agencies and/or within research contracts established with its industry partners.

Sask Polytech staff approve submitted applications and/or research contracts in accordance with Sask Polytech's Management Authorities Grid (described in **Figure 4**).

We found there are few budgeting requirements associated with external projects that are solely industry-funded, as the budget is equal to the contributions of the industry partner.

For each of 19 applied research projects—10 external, nine internal—we tested:

➢ Sask Polytech estimated the resources necessary (e.g., time of faculty and students, necessary equipment) to carry out the research project. For five of these projects—four external and one internal—the project file clearly showed that researchers identified the need for and received technical training (e.g., training for operating a drone, specialized software training).

➢ The project budgets were consistent with the scope of the research project (i.e., aligned with expected funding).

➢ Sask Polytech had approved the project application or funding agreement consistent with its policy.

The consistent establishment of project plans helps the Research Office hold researchers accountable for completing projects on-budget and in a timely manner.

4.8   Use of Funding Agreements Not Clear

Sask Polytech has not specifically established when it requires funding agreements with industry partners involved in applied research projects.

Funding agreements for research projects typically set out responsibilities of the parties involved, funding details (e.g., cash or in-kind contributions), termination conditions, key deliverables, and associated project deadlines.

Research Office staff use their judgment when determining the need for establishing a funding agreement with an industry partner. The Office has not specifically established when it requires such agreements.

For five of 10 externally funded applied research projects we tested involving both an external funding agency and an industry partner, Sask Polytech did not enter into a funding agreement with the industry partner. For two of these external projects, the industry partners provided in-kind contributions (e.g., office or lab space, provision of staff resources) instead of funding.

Not establishing funding agreements with industry partners increases the risk of Sask Polytech not recovering verbally agreed upon project funding if a partner were to terminate its involvement with a project. Such circumstances could jeopardize Sask Polytech's ability to complete the project and meet its deliverables to other stakeholders (such as federal granting agencies where industry partners match federal funding).

> **4. We recommend Saskatchewan Polytechnic establish guidance about requiring funding agreements with industry partners involved in applied research projects.**

4.9 Project Budgets and Deliverables Actively Monitored

Sask Polytech actively monitors whether researchers completed projects within established budgets, and met agreed-upon project deliverables.

The Research Office uses spreadsheets to track budget and actual costs for external applied research projects on a monthly basis. The Research Support Co-ordinator updates actual costs using information about each project recorded in Sask Polytech's financial system.[25] The Co-ordinator regularly meets with researchers (at least monthly) to understand the status of their projects (e.g., research costs remaining). At times, the Research Office staff may adjust project budgets, such as for changes in project requirements like project materials or staffing. If budget overages occur, Sask Polytech makes the Dean of the school responsible for the project cover the overage from that school's budget.

Researchers are responsible to monitor completion of their project deliverables.

For 19 applied research projects—10 external, nine internal—tested, we found:

➢ The Research Support Co-ordinator tracked the budget and actual costs for the external research projects in spreadsheets

➢ None of the projects had significant budget overages

➢ Researchers met their project deliverables (e.g., completion of final research reports) or had properly approved extensions

Timely monitoring of research project costs and deliverables holds researchers accountable for their projects. Completing research projects within budget and within agreed upon deadlines contributes positively to Sask Polytech's reputation and ability to attract future research funding.

4.10 Inventory of Research Projects Incomplete

As the number of research projects grow, complete project information in an inventory allows the Research Office to efficiently track and report on projects. The Research Office recently began using spreadsheets to track and maintain an inventory of its external applied research projects, though we found the spreadsheets do not include complete information.

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[25] Each research project has its own unique identifier (i.e., organization code) in the system to enable this process.

We found the Research Office began developing an inventory of its external applied research projects in mid-2019. The Research Office used spreadsheets as it did not have an IT system to assist with recording information on its projects. It created two spreadsheets—one for projects receiving funding from federal agencies and another for projects involving funding agreements with industry partners—to summarize details about the projects (e.g., name, project status, project dates, funding source, ethics approvals).

We reviewed the Research Office's project inventory spreadsheets and found that nine of 10 external projects tested were appropriately included in the spreadsheets—one project was mistakenly included in both spreadsheets. However, for seven of the 10 projects tested, we found the spreadsheets did not include up-to-date information (e.g., project status, project dates, ethics approvals). Management indicated the spreadsheets were incomplete because staff had not had a chance to update the spreadsheets since it just began using them earlier in the year.

Improving its current documentation of research projects will better position Sask Polytech to track and report on projects as it grows its applied research activities and has an increased number of projects.

> 5. **We recommend Saskatchewan Polytechnic maintain an accurate and complete inventory of its applied research projects (e.g., project status, project dates, ethics approvals).**

4.11 Faculty Encouraged and Supported to do Applied Research

Sask Polytech adequately encourages and supports faculty to take on applied research projects.

The Research Office developed six webinars about applied research and made them available to faculty on Sask Polytech's intranet.

We found the content of these webinars reasonable. They gave researchers useful information about responsibilities for applied research at a project level. More specifically, the webinars provided information about external research funding opportunities for collaborative research, sources of funding, and information about specific funding agencies (e.g., NSERC, SSHRC).

Defined roles for staff, along with supports for faculty, help clarify responsibilities associated with applied research activities. Having this information will help Sask Polytech as it continues to grow its applied research and in the event of staff turnover.

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