

FOCUSING ON RESULTS: TRAINING

Infrastructure funded by the Canada Foundation for Innovation enriches the training environment at research institutions in Canada and helps students and postdoctoral fellows acquire skills and expertise that give them a competitive advantage

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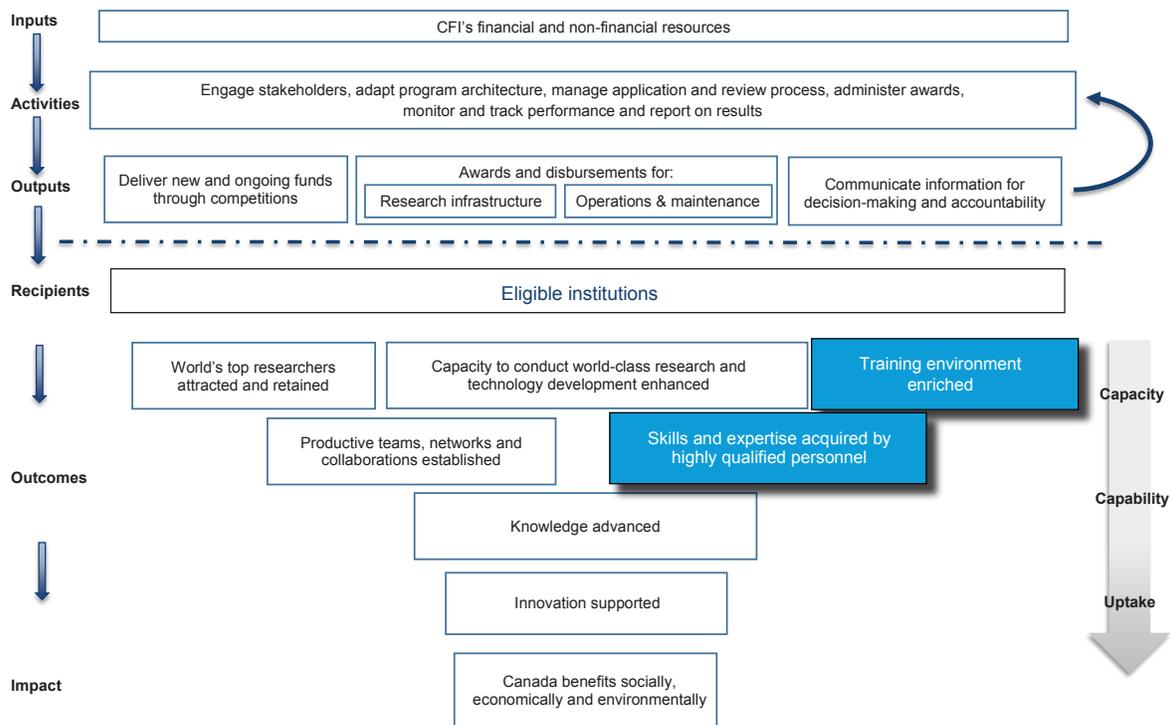
INTRODUCTION

The Canada Foundation for Innovation (CFI) awards funding for research infrastructure through an independent, competitive merit-review process to Canada’s universities, colleges, research hospitals and non-profit research organizations to increase their ability to carry out high-quality research.

The organization’s objectives and expected results, as outlined in its funding and contribution agreements with the Government of Canada, are operationalized through a logic model (**Figure 1**).

This report presents evidence of training-related outcomes being achieved through CFI-funded infrastructure, focusing on the capacity of institutions to train the next generation of researchers through an enriched training environment, and the acquisition of skills and expertise by highly qualified personnel.

Figure 1: CFI logic model



Data presented in the report were obtained through several sources:

- project progress reports submitted over the period of 2013–2017,
- opinions provided through a 2016 survey of Master’s and doctoral students,
- a 2017 survey of the CFI’s clients, stakeholders and project leaders, and
- recent discussions held with trainees using CFI infrastructure and researchers leading CFI-funded projects.

(See the [Annex – Methodology](#) section for further details.)

KEY FINDINGS

On average, over 27,000 students and postdoctoral fellows use CFI-funded infrastructure annually as a key resource for their research. This high-quality, cutting-edge research infrastructure:

- **creates an ideal environment in which to train the next generation of innovative thinkers**
 - Trainees feel that CFI-funded equipment and specialized research space enhanced their training environment and enabled collaborations.
 - Almost all (95%) researchers leading CFI-funded projects confirmed that CFI infrastructure is being used in the research being conducted by the trainees and that it has a high impact on the quality of the training environment (92%).
- **allows trainees to develop skills and gain knowledge and expertise**
 - Hands-on experience with CFI-funded infrastructure enables trainees to acquire a vast array of skills and expertise, particularly the ability to operate highly specialized equipment, as well as advanced research and analytical capabilities.
- **gives trainees a competitive advantage, positioning them for success**
 - Trainees feel that hands-on experience with CFI-funded infrastructure enables them to develop skills and abilities that strengthen their research training and improve their competitiveness to pursue future training and employment.
 - Since 2013, 19,227 students and postdoctoral fellows who used CFI-funded infrastructure as a key resource for their research completed their training, with a little over half pursuing further training and the remainder becoming employed. Those who moved into the workforce in Canada are employed in academia, government, private companies and not-for-profit organizations, thus benefiting all sectors of the economy.



The CFI-funded infrastructure acts as a magnet to draw candidates from Canada and abroad. When they finish their studies, they are snapped up by companies, government agencies, and universities, thanks to the exceptional technical expertise acquired while working with the infrastructure.

— Chandra Madramootoo,
Professor, McGill University

RESEARCH INFRASTRUCTURE CREATES AN IDEAL ENVIRONMENT IN WHICH TO TRAIN THE NEXT GENERATION OF INNOVATIVE THINKERS

Data obtained through CFI project progress reports (PPRs) over the period of 2013 to 2017 show that almost all project leaders consistently report each year that CFI-funded infrastructure is used as a key resource in research being conducted by their trainees and that it has a high to very high impact on the quality of the training environment:

92% of project leaders consistently report that CFI-funded infrastructure has a high to very high impact on the quality of the training environment

95% of project leaders consistently report that CFI-funded infrastructure is used as a key resource in research being conducted by their trainees

74% of Master's and doctoral students were satisfied with CFI-funded infrastructure that was available to them

As part of a 2016 evaluation of the Canada Graduate Scholarship (CGS) program, Master's and doctoral students who received a CGS award or applied for but never received a federal government scholarship award were invited to participate in a survey. Respondents were asked to provide their level of satisfaction with infrastructure that was available to them during their studies. Those who provided an opinion were then asked to rate their satisfaction with CFI-funded infrastructure that was available to them. Nearly three quarters indicated some degree of satisfaction. Those who answered "don't know" or "not applicable" were assumed not to have had access to any CFI-funded infrastructure. However, given the wording of the question, it is possible that those "not satisfied" may have been rating the amount of access they had to CFI-funded infrastructure rather than expressing a dissatisfaction with any infrastructure they did use.

From 2013 to 2017, a yearly average of **27,296** postdoctoral fellows and students were reported through the PPR as having used CFI-funded infrastructure as a key resource for their research. This represents approximately **16** trainees per project per year (**Figure 2**). Note that the number and variability of projects submitting reports each year can affect the number of outcomes reported, such as trainees, and can result in variability in trends from year to year and over time. Of the annual average number of trainees who have used CFI-funded infrastructure, doctoral students accounted for the most, at **31%** (**Figure 3**).

Figure 2: Number of students and postdoctoral fellows using CFI-funded infrastructure

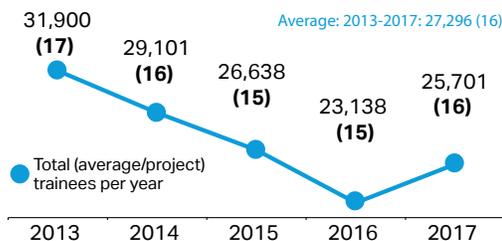
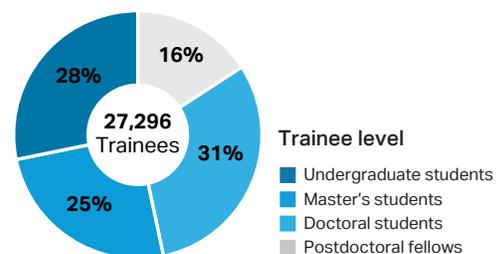


Figure 3: Percentage of trainees using CFI-funded infrastructure by level



The CFI conducted focus group discussions with students and postdoctoral fellows who are using or had used CFI-funded infrastructure at a number of research institutions across Canada in 2016 and 2017. Over the course of these discussions, a number of trainees mentioned that CFI funding enhanced their training environment and enabled collaborations. For example, one participant explained that their research team used CFI funding to create new space, which had a positive impact on the research environment because researchers and students became consolidated. This created new collaborations and enhanced existing ones. The participant further noted that this newly created space includes a work area for trainees that is “more welcoming” and encourages trainees to work collaboratively rather than in isolation. As a result, students and post-docs can discuss their challenges, brainstorm and problem solve with their peers and mentors, which was recognized as a real strength and an enhancement to their training environment. More details on the results of the focus group discussions can be accessed [here](#).

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My graduate student researcher cohort is growing quickly, and the laboratory environment I have constructed thanks to my CFI award has and will continue to be absolutely vital in this process.

— Douglas Van Nort,
Canada Research Chair
in Digital Performance, York University

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My research would not be possible without this infrastructure, which is helping to train highly qualified personnel (HQP) in the use of state-of-the-art instrumentation and technology. It is a rare opportunity for HQP to develop new methods using such instrumentation. It will spur the next generation of creative and innovative thinkers and researchers.”

— Tanya Dahms, Professor,
University of Regina

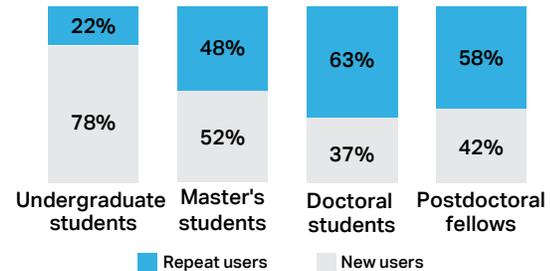
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The infrastructure has been invaluable for recruiting top undergraduate and graduate students, as well as postdoctoral fellows.

— Tuan Trang, Associate Professor,
University of Calgary

PPR data revealed that project leaders reported that on average, **14,400** trainees a year had used CFI-funded infrastructure for the first time and almost **12,900** trainees a year had used it previously. The proportion of repeat users among students and postdoctoral fellows reflects the duration of the research portion of their training. Undergraduate students represent the highest proportion of new users, and doctoral students, who require use of the same research infrastructure year over year, represent the highest proportion of repeat users (**Figure 4**).

Figure 4: Percentage of first-time and repeat users by level



HANDS-ON USE OF STATE-OF-THE-ART INFRASTRUCTURE ALLOWS TRAINEES TO DEVELOP SKILLS AND GAIN KNOWLEDGE AND EXPERTISE

Hands-on opportunities with, and collaborations resulting from, CFI-funded infrastructure were identified through focus groups with trainees as supporting the development of a wide range of skills and expertise. The most frequently identified was expertise in the operation of highly specialized equipment. By calibrating equipment and setting up and running experiments, students and post-docs gain expertise in operating and troubleshooting cutting-edge research infrastructure. As well, trainees reported advancing their research and analytical skills using CFI-funded infrastructure. Opportunities to plan and execute complex projects help them develop their understanding of various research methodologies while allowing them to improve analytical and problem-solving skills.

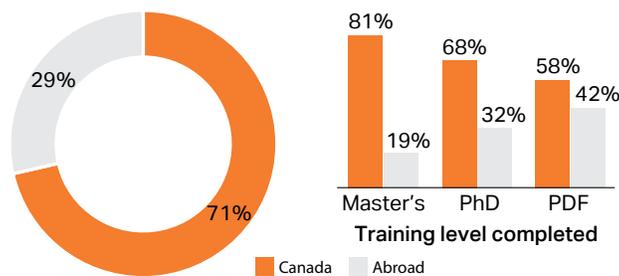
RESEARCH INFRASTRUCTURE POSITIONS A NEW GENERATION FOR SUCCESS

Focus group sessions with students and postdoctoral fellows revealed that CFI-funded research provided opportunities for research and collaboration, which helped them to advance their skills and abilities. As a result, trainees feel that they possess a competitive advantage in terms of pursuing further education or future employment. For example, a handful of participants believe their experiences using research infrastructure will be beneficial for work in the private sector. One participant said: "It's nice to have access to this broad range of equipment, because it broadens the scope of the types of questions that you can then go and answer and study when you move on to a career in industry."

Over the past five years, project leaders reported through the PPR that **19,227** trainees who used CFI-funded infrastructure as a key resource for their research completed their graduate degree or postdoctoral training. Those who completed their training either pursued further training (**9,737**) or obtained employment (**9,490**).¹

Of those pursuing further training, **71%** stayed in Canada. However, as they progress through the research training pathway, graduates and postdoctoral fellows (PDFs) are more likely to pursue training opportunities abroad (**Figure 5**).

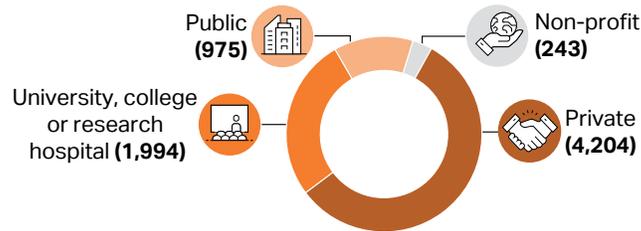
Figure 5: Percentage of trainees pursuing further training by location



¹ Project leaders filling out the PPR also have the option of entering the number of individuals who completed their training under a category of "other" and are required to provide context for their response. Over the period of 2013–2017, approximately 6% (1,197) of those who completed their training were entered under "other." Given that the explanations for the responses varied significantly across projects and years (e.g. maternity leave, looking for work), the category of "other" was excluded from the analysis.

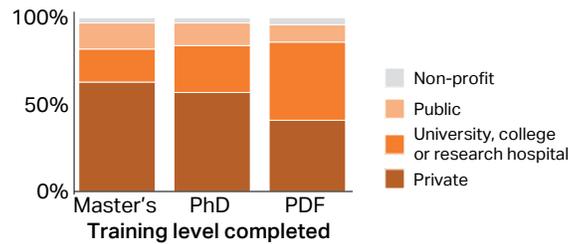
Among the trainees who completed their graduate degree or postdoctoral training and obtained employment, **7,416 (78%)** secured work in Canada. The remaining **22% (2,074)** found work abroad. Of those who remained in Canada, over half (**56%**) found employment in the private sector (**Figure 6**).

Figure 6: Employment in Canada by sector of trainees having completed their training



Trainees gaining employment in Canada with a graduate degree (Master’s or PhD) are more likely to obtain a position within the private sector, while postdoctoral fellows are more frequently hired by universities, colleges or research hospitals (**Figure 7**).

Figure 7: Percentage of trainees having completed their training employed in Canada by level and sector



Being able to carry out research on the crest of the wave thanks to the infrastructure made available through CFI and provincial partner funding, is an exceptional experience for the highly qualified personnel, and allows them to then advance into leadership positions in both academia and industry with a broad and clear view of what is needed to carry out effective and meaningful research of the highest standards.

— 2017 CFI stakeholder survey

CONCLUSION

Evidence presented in this report demonstrates that the CFI is delivering on training-related objectives depicted in the organization's logic model, namely that CFI-funded infrastructure is enhancing the capacity of institutions to train the next generation of researchers through an enriched training environment and helps them acquire skills and expertise.

Almost all researchers leading CFI-funded projects confirmed that their infrastructure is being used in the research being conducted by their trainees and that it has a high impact on the quality of the training environment. Most graduate students report feeling satisfied with the CFI-funded infrastructure available to them.

Experience on CFI-funded infrastructure enables trainees to acquire a vast array of skills and expertise that provides them with a competitive advantage, thus expanding advanced research training and job opportunities to position them for success. Over 27,000 students and postdoctoral fellows use CFI-funded infrastructure annually. Of those who completed their training, a little over half pursued further training, while the rest became employed. The majority of those who finished continued their training or found employment in Canada, benefiting all sectors of the economy.

ANNEX - METHODOLOGY

Data presented in this report were obtained through the following sources:

- 1. Project Progress Reports (PPRs)** – The CFI collects data annually from its funded institutions through project progress reports (PPRs). Data submitted through PPRs over the period of 2013 to 2017 were analyzed, with emphasis on questions pertaining to training.
- 2. Satisfaction Survey** – Opinions solicited through a 2017 survey conducted by the CFI of its clients, stakeholders and project leaders were analyzed in terms of comments provided regarding the CFI's contribution to training.
- 3. Trainee Focus Groups** – Opinions solicited through 7 focus groups held by the CFI across Canada in 2016 and 2017 involving 11 institutions and 79 students and postdoctoral fellows using, or previously used, CFI-funded infrastructure were analyzed in terms of comments made regarding skills and expertise acquisition resulting from CFI investments in infrastructure.
- 4. Interviews** – Comments related to the impact of CFI-funded infrastructure on trainees were provided by researchers using or benefiting from CFI investments. Opinions were gathered through interviews held by the CFI during 2016–17 and will inform several outcome reporting studies.
- 5. Canada Graduate Scholarship Program Evaluation Survey** – Data provided through a 2016 survey of Master's and doctoral students who received a Canada Graduate Scholarship or who had applied for but never received a federal granting agency scholarship were analyzed in relation to a question asked about satisfaction with CFI-funded infrastructure. More details on the survey can be found [here](#).

