SPECIAL REPORT

Research Manitoba

PARTNERS IN PROGRESS

RESEARCH MANITOBA TEAMS UP WITH MITACS TO SUPPORT INNOVATIVE PROJECTS

Research Manitoba has a mandate to promote, support and co-ordinate the funding of scientific inquiry in the areas of health, natural and social sciences, engineering and the humanities.

In order to fulfill its mission, the provincial funding body often partners with government and non-government agencies and groups dedicated to promoting research in these fields.

One of Research Manitoba's key partners is Mitacs, a national, not-for-profit organization with a backstory that is almost as impressive as its record of achievement.

Originally launched 17 years ago, Mitacs began life with the goals of promoting mathematics as a tool for industrial development and providing opportunities for graduate students. The organization's initial budget was $3.2 million.

Since then, Mitacs (the name was originally an acronym for The Mathematics of Information Technology and Complex Systems when it was formed in 1998, but is now simply known as Mitacs) has developed into an important supporter of Canadian research. Over the years, it has expanded into all academic disciplines, working with 60 universities, thousands of companies, and both federal and provincial governments. In doing so, it has established itself as a leader in forging relationships to support industrial and social innovation in Canada.

One of Mitacs' most important achievements was the creation in 2003 of a research internship program to facilitate the deployment of graduate students into the private sector. Over the past 15 years, Mitacs has supported more than 10,000 research internships, trained more than 19,000 student and post-doctoral career-skills participants, and supported more than 1,300 international research collaborations.

In 2012, the Manitoba government provided Mitacs with $1 million in funding over three years to support research in a variety of ways. Recently, Research Manitoba announced it would invest an additional $1.4 million for Mitacs programs over the next three years. The funding agreement will bring hundreds of research and training opportunities to Manitoba students, post-doctoral students and faculty members through the following three Mitacs programs:

- **Accelerate:** This program pairs graduate students and post-doctoral fellows with businesses and not-for-profit organizations to undertake research projects of mutual interest.

- **Elevate:** This program supports customized research management training for post-doctoral fellows as they undertake two-year research projects with partner organizations.

- **Globalink:** This program offers two-way mobility initiatives between universities and undergraduate and graduate students from around the world to build and strengthen international research networks.

This special report, sponsored by Research Manitoba, highlights some of innovative research projects currently underway, thanks to the support of these programs.

BRIDGING TWO WORLDS

WINNIPEG-LED RESEARCH GROUP AIMS TO EASE TRANSITION FOR REFUGEES

By Sharon Chisvin

As Canada continues to welcome thousands more Syrian refugees in the next few months, Winnipeg's Jan Stewart is already focused on ensuring their long-term success.

Stewart is the principal investigator for a Canadian study entitled *Bridging Two Worlds: Culturally Responsive Career Development Programs and Services to Meet the Needs of Newcomer and Refugee Children in Canada*. The study, which began last year, is examining best practices for career development and integration of young refugees into Canadian life.

"The overarching goal of this research is to provide school counsellors with the knowledge and resources to provide more informed and culturally responsive career development and guidance to newcomer and refugee youth," says Stewart, a professor and acting associate dean at the University of Winnipeg's Faculty of Education.

The three-year project is being funded by the Social Sciences and Humanities Research Council (SSHRC), the Canadian Education and Research Institute for Counselling (CERIC), Research Manitoba and Mitacs, a national, not-for-profit organization that supports university-industry research collaborations.

The Bridging Two Worlds study was a logical next step for Stewart, who has spent much of her 30-year career researching the psychosocial needs of refugee children and developing interactive school counselling tools.

"In earlier research, I found that refugee students had very similar aspirations (to other students) yet there was incongruence in their course selection, experience and grades for getting accepted into these fields," she explains.

"Participants I interviewed indicated that more needs to be done in the area of lifelong career development for all students, and this is even more pronounced for students who have come from other countries."

Consultations with Manitoba NGOs and service providers later confirmed these findings.

"They were telling us that there was a gap in services for students who have refugee backgrounds and who would not have the academic levels to attend post-secondary education," Stewart says.

Many of these students, she adds, also have difficulty finding entry-level jobs while they are attending high school and even once they graduate. Many, as well, lack employment knowledge and background on Canadian workplace cultures and norms.

"There seems to be two converging issues for me," Stewart elaborates. "One, career counselling in schools really has not been a priority, and we have seen a decline in services and programs for youth. And two, refugee children and youth have additional challenges and barriers related to career development and integration."

Stewart's new study aims to target both areas and to find practical solutions that can be applied across the country.

The study will achieve this through a variety of methods, including conducting a needs assessment of the existing career development and counselling programs in middle and secondary schools, and examining best practices for fostering informed career decision-making for newcomers and refugee youth. The study's researchers also will be holding community forums, consultative workshops and regional focus groups, and conduct hundreds of

interviews in four Canadian cities.

These cities, Winnipeg, Calgary, Charlottetown and St. John's, were selected for the study because they all have experienced increased immigration over the last decade, due to provincial policy, and are all expected to continue to attract newcomers in the immediate future.

Jan Stewart (left) and Caitlin Forsey are working on a research project that will help school counsellors provide better career development and guidance to newcomer and refugee youth.

"Each site is responsible for conducting 80 interviews with students, parents, teachers, settlement agencies and community organizations, in addition to in-depth observations of 10 programs that are working in each province," explains Caitlin Forsey.

Forsey, the project's overall co-ordinator, is a post-doctoral research fellow in the Faculty of Education at the University of Winnipeg. As a Mitacs intern, she already has been given the opportunity to interview dozens of newcomer and refugee students in Winnipeg's inner-city schools, and observe a variety of local programs that provide settlement support for newcomers.

"Prior to joining the team, I had never interviewed youth, let alone youth with refugee backgrounds," she says. "Interviewing war-affected individuals is challenging because you want to remain compassionate while also acknowledging their resiliency."

The experience, she says, definitely broadened her skills as a qualitative interviewer. But the support that Mitacs provides to the study, she suggests, extends far beyond her personal resume.

"It is unusual for educational research on newcomers and refugees to span across four provinces," Forsey says. "As a result of our focus on middle and secondary schools and our ability to simultaneously co-ordinate four research sites, CERIC agreed to partner with Mitacs and to support this research endeavour."

CERIC, she adds, has never before partnered with a university that operates a research program across several jurisdictions.

In total, there are seven Mitacs interns working on the project. One of them, Hua Que, a PhD candidate at Newfoundland's Memorial University in St. John's, is especially excited about the relevance of their research considering the current refugee crisis.

"I believe conducting research in this area can draw people's attention to refugees, build a more welcoming community and help refugees be more successful in Canada," she says.

The fact that she is in St. John's and Forsey is thousands of kilometres away in Winnipeg offers an opportunity to compare the strengths and weaknesses of different settlement approaches.

Using these comparisons, the researchers will develop recommendations for policy and best practices, and create lessons, activities and other professional development resources for school counsellors, teachers, and government and community agencies. Their findings also will be used to develop an education credit course on culturally responsive counselling, and be made accessible online as a web-based document. As well, Winnipeg will host a national forum to share the findings in the summer of 2017.

By then, Canada likely will have welcomed thousands of new refugees from Syria and other parts of the world, among them numerous school-aged children. It is these children who will benefit from Stewart's exhaustive study – a study that will ensure that school counsellors are better prepared to provide career counselling to newcomer and refugee youth, and that, as a result, they are better prepared to integrate successfully into Canadian life.

"Although we could not have predicted this would happen when we began the study," Forsey says, "we are grateful to be in a position to contribute to the broader discussion surrounding Canada's role in supporting newcomers and refugees."

SOARING WITH SOFTWARE

JET ENGINE SIMULATOR PROJECT SUPPORTS MANITOBA'S AEROSPACE INDUSTRY

By Joel Schlesinger

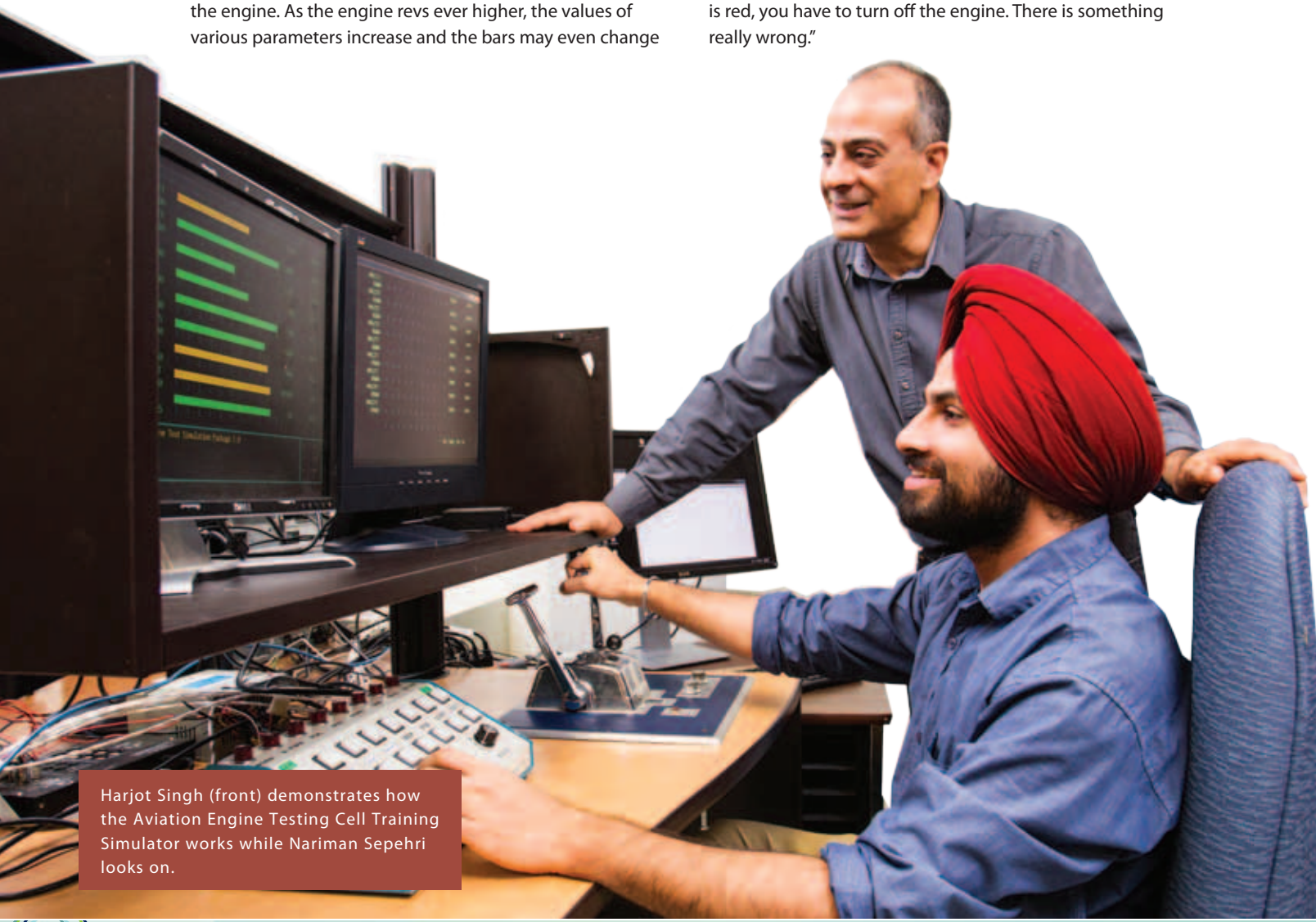
With the flip of a switch, Harjot Singh fires up the jet engine and waits for a response.

A monitor lights up, providing him with a summary of various parameters (engine performance indicators), including fan speed, exhaust temperature, core speed and engine thrust.

Initially, the values of parameters are shown as green bars, which means everything is working as it should.

But then things start to change. Singh starts to push the throttle in front of him, increasing the flow of fuel to the engine. As the engine revs ever higher, the values of various parameters increase and the bars may even change colour – first yellow, then red.

Ordinarily, this would not be a good thing, says Singh, who is a graduate student at the University of Manitoba's Department of Mechanical Engineering in the Faculty of Engineering. "When the parameters reach their critical value, they start showing as yellow or red on the display screen," explains Singh. "Yellow means there are some problems, but you can pull back (the throttle). But when it is red, you have to turn off the engine. There is something really wrong."



Harjot Singh (front) demonstrates how the Aviation Engine Testing Cell Training Simulator works while Nariman Sepehri looks on.

But there are no such worries today.

That's because the engine under Singh's control is not really an engine at all. It is a computer software program designed to simulate the testing of an actual jet engine in an air tunnel, such as the one at the engine testing facility at James Richardson International Airport.

The simulator was developed by Singh under a program sponsored by Research Manitoba and Mitacs – a national, non-profit organization supporting collaborative research between post-secondary institutions and industry. The specific project, known as the *Aviation Engine Testing Cell Training Simulator,* is also supported by GE, Standard Aero and WestCaRD, an aerospace research and development incubator.

Nariman Sepehri, a professor of mechanical engineering and the lead investigator for the project at the U of M, says the idea is to use the simulation program to train novice engine testers.

This would be beneficial to industry because using real aviation jet engines to train novice testers can be costly and potentially damaging to engines and other equipment. "We know that simulation software is much cheaper than using the actual engine for training" says Sepehri.

Simulators are commonly used in the aerospace industry. For example, pilots are trained using a flight simulator before climbing into a real cockpit. Like the flight simulator, the aviation engine test cell simulator will cut down on the cost of training. At the same time, it will help expand the province's capacity to test engines for North American aerospace firms because the industry cannot grow without more testers.

Winnipeg is already known as one of the most popular places in the world to test jet engines, in part because of its skill base, but also because of the climate.

"Commercial aircraft engines have to be tested in a cold environment that simulates very low temperature in the air when they are operating," Sepehri says.

The airport's GE Aviation Test Research and Development Centre, run jointly by GE and Standard Aero, is the ideal place to carry out this sort of work.

First opened in 2011, the facility is currently undergoing a $26-million upgrade. With the expansion comes the need to grow the talent base. To date, that's presented a conundrum for the industry.

"Initial training involving testing of equipment is not recommended due to the potential for damaging the equipment, and the cost of the equipment and its maintenance is also another barrier," Singh says. "That's why we were asked to develop a simulator – because it involves no risk."

Simply put: On a simulator, operators can make mistakes without real consequence.

"Instead of putting an actual engine in the wind tunnel, we simulate the conditions of an engine as if it is actually running in the wind tunnel," Sepehri says.

The university isn't the only post-secondary institution participating in this research. Red River College (led by Research Chair Fred Doern) has been developing the display for the simulator, emulating the design of the console for actual testing equipment.

And for Singh, specifically, the project has been a unique opportunity because he had no experience in software development.

"I had no prior experience with programming," says Singh, who completed his undergraduate studies in India. "So it was a great opportunity for me to get into these computer languages that would really help me as a mechanical engineer."

In developing the simulation program, Singh was able to access open-source software from NASA for jet engine testing, along with engine design software developed by researchers in Germany. Integral to his work was MATLAB, an engineering and scientific programming platform that helped him synthesize bits of other programs into new software.

And so far, so good: The simulator functions similar to an actual test – at least as far as Singh can tell. The next step is to work with trainees and veteran engine test operators to evaluate the system.

"The question we will ask them is, based on their experience, does the simulator emulate what they would normally see and feel during an actual engine test?" Sepehri says.

"In this respect, not only do we need experienced operators to work with us to find out what they think, but we need novice ones too to understand how quickly they learn different testing scenarios when they are exposed to the simulator."

As a followup, the research would also involve measuring how much the experience on a simulator improves proficiency when performing tests on the actual testing equipment.

If successful, Sepehri says more work remains to be done, including developing the software to simulate different jet engines.

Once complete, the simulator will be an enormous boon for the industry, allowing Manitoba to train more testers, more quickly. No longer will the training be dependent on the availability of a real engine for testing. The operators can train any time and, more importantly, without concern about making a costly mistake that could damage an engine.

Equally important, the simulator will help current testers improve their skills because they will be able to train for a wider range of scenarios – including worst-case ones like an engine catching fire.

"When being trained only with real engines, the operators may not be getting enough exposure to engine fault scenarios of different kinds," Sepehri says. "But with the simulator, they can get exposed to faults more, in turn, making them more competent."

By building the province's testing capacity, the simulator will only enhance Manitoba's already outstanding reputation as a hub for aerospace research and development, Sepehri says.

"It can only help our aerospace industry, increasing the recognition that Winnipeg is a place for innovation and, just as importantly, it will bring more job opportunities for Manitobans."

"It can only help our aerospace industry, increasing the recognition that Winnipeg is a place for innovation…"

THE LAY OF THE LAND

FIRST NATION LAND USE RESEARCH AIMS TO CHANGE THE WAY WE LOOK AT A MAP OF MANITOBA

By Joel Schlesinger

Shirley Thompson hopes the mapping project will raise awareness.

Someday soon, Anita Olsen Harper believes we will look at a map of Manitoba a whole lot differently. The map won't simply delineate the province's borders, its lakes, rivers and roads. In fact, it will show much more than geographical features or the location of municipalities.

One day, she hopes, the map will also reflect the rich traditional and current cultural and economic land use of First Nations – where they once hunted and fished and where they still carry on those traditions today. Even their sacred sites would be mapped.

And Harper, a post-doctoral researcher at the University of Manitoba's Natural Resources Institute, is working to make that happen. She is part of a 10-person research group from the university that is working to develop a land use map for a large area of Manitoba that often appears to be nothing more than a vast stretch of wilderness.

The project, entitled *Land Use Mapping and Planning for Sustainable Development with Island Lake First Nations and other East-side Communities in Manitoba,* aims to document the use of Indigenous traditional lands – both on reserves and crown land – in a bid to ensure government and industry engage more equitably with First Nations.

"This has to do with recording the history of the people, which is different from recording the history of non-Aboriginal people because our history has an oral tradition," says Olsen Harper, who hails from Lac Seul First Nation, a few hundred kilometres south of the area of focus for the research.

"But oral history doesn't make it any less valid than what you would read in a Canadian history book," says Olsen Harper, who is the widow of Elijah Harper, a First Nations leader best known for his pivotal role in blocking the Meech Lake Accord in 1990.

"We're trying to look at our native land, especially in the north, where the only people in these areas are First Nations communities, to help them benefit more from the developable resources," says Shirley Thompson, principal investigator of the project and associate professor at the university's Natural Resources Institute.

"This project is about showing an alternative way of land development to serve First Nations' interests first, and those interests are very much based on medicines, spirituality and traditions."

Funded in part by Mitacs – a non-profit national organization providing research opportunities for post-secondary students – the study has partnered with the First

Mapping project team members, from left: Malay Das, Ryan Klatt, Ahmed Oyegunle, Shirley Thompson, Michelle Shepard, Pepper Pritty, Tosan Okorosobo.

Nations communities of Hollow Water, St. Theresa Point, Garden Hill and Red Sucker Lake.

Olsen Harper says the project involves, in large part, safeguarding the history of the people who have lived there for thousands of years, as well as their current activities.

"Part of the purpose of this mapping and recording history is to protect our traditional territories," she says.

And their traditional territories, which are intrinsic to the well-being of their culture, are under threat from current land use by other stakeholders like government and industry.

While economic development has occurred in these areas, the communities rarely receive tangible benefit.

"We've been so subjected to outside corporations coming in to do their mining and forestry," Olsen Harper says, adding it often negatively impacts their traditional use of the land. "Our experience as First Nations is that we have not been involved in these economic activities, nor have we been consulted."

The land use project aims to change this relationship by raising awareness among the general public, government and industry of how the region sustains the Indigenous people who live there.

"So far, we've mapped the land use of maybe 150 people, and then we interviewed them afterward, asking what kind of development they want in the communities," Thompson says, adding that the research involves graduate and post-doctoral students from a variety of academic disciplines.

The team is planning to build a land use map for the east side of Lake Winnipeg. Currently, the area is largely only accessible by ice roads in the winter, and air or boat in the summer. But roads are expected soon to facilitate increased hydroelectric, mining and forestry activities.

In part, the research is supported by the Wabanong Nakaygum Okimawin Planning Initiative to develop a land use plan for the area through consultation with local communities, government and industry. Also spearheading the initiative is the Wabanong Nakaygum Okimawin Council of Chiefs that represents 16 First Nations communities in the region.

"It's a colossal area," Thompson says,

Team member Ryan Klatt holds a drone used for video-making and mapping.

adding it encompasses tens of thousands of square kilometres. "The residents there are actively using the land – that's the one thing our mapping is showing… they're still going out and using absolutely every square inch of this land."

And often their activities are at odds and even threatened by industrial development – economic activity that, for the most part, excludes First Nations communities.

In fact, after surveying these communities, researchers have discovered that there is profound trepidation regarding development.

"It's not that they don't want economic development, but when it comes to forestry, for example, they want it to be able to construct homes in their communities," Thompson says. "Or if they're going to be involved in mining, there has to be meaningful revenue sharing."

Researchers have also heard that these communities want development done differently.

"They're saying, 'We want the land to stay the same,' and that the development they want is human development," Thompson says.

In fact, part of the project involves helping communities with small-scale economic development like a 15-acre farm in Garden Hill with 1,200 chickens. Others have involved commercial fishing projects.

The problem is these communities face significant challenges to growing their economies.

"They don't have any banks, so it's almost impossible to run a business," says Thompson.

Moreover, the communities grapple with barriers not faced in other Manitoba communities that negatively affect health and well-being, in turn hampering economic development.

"For example, at least 50 per cent of the houses in these communities don't have running water," says Thompson.

The land use project should help address these challenges, she adds, and more broadly shed light onto a massive area of Manitoba. "In reality, only a tenth of the province has been mapped for land use, and it's never been done from the perspective of First Nations."

Once complete, the research will serve as an impetus for better relations between First Nations in Manitoba, and government and industry.

Perhaps it will even lead to a model similar to Northern Ontario, where no development occurs without consultation and approval of affected First Nations under the Far North Act, Thompson says.

"That hasn't occurred on the east side of the lake in Manitoba," she says. "This project will hopefully spur this process where First Nations just don't have consultation rights, but also a say in where development occurs."

And in turn they will share in the benefits.

"There has to be some revenue sharing because this land has been unused by anyone else, so for companies to claim (billions of dollars) in resources and walk away without sharing, while the community next door is without water, is absurd and wrong," Thompson says.

"We have to see a better balance."

GREEN TEAM

U OF M RESEARCHERS USE HIGH-TECH ROBOT TO TEST WORKPLACE ENVIRONMENTAL QUALITY

By Holli Moncrieff

The first thing you notice when you walk into Shauna Mallory-Hill's lab at the University of Manitoba is the robot-like machine in the corner.

Standing about six feet tall, the Indoor Environmental Quality (IEQ) Cart looks like it could pass for a variation of the mechanical characters found in many sci-fi movies.

But unlike its Hollywood cousins, this machine is not just for show. It's a key player in a research project that could influence the look and feel of workplaces in the future.

Led by Mallory-Hill, an assistant professor in the Department of Interior Design at the university's Faculty of Architecture, the study is looking into whether a well-designed, environmentally friendly office space can enhance the productivity and well-being of its employees.

Which is where the IEQ Cart comes into play.

Built in Manitoba with the technical help of Price Research Center North, the IEQ Cart is based on a prototype developed by the National Research Council. It features a series of sophisticated sensors that mimic the human senses.

As Mallory-Hill explains, "It can breathe, as a human being would. It can also see, hear, and feel – sensing the temperature and air movement around it."

These qualities allow the IEQ Cart to analyze every aspect of the workplace environment – from air quality to ambient noise to how hot or cold the room is.

The value of the machine and the research it enables is clear, says Mallory-Hill.

As she explains, people spend 80 to 90 per cent of their time inside a workplace environment, and 80 to 90 per cent of a company's money goes toward staffing costs.

Yet, there have been occasions when a lack of understanding of the design of indoor environments has led to the construction of buildings that undermine worker productivity and well-being.

"In the '70s, we rushed to seal up buildings so tightly (as part of an energy conservation measure) that we ended up with something called 'sick building syndrome,' because air quality was so bad," she says. "You can talk to anyone who works in a poor indoor environment – they will tell you it impacts their health and productivity."

And while many design strategies have been deployed to improve environment quality over the years, Mallory-Hill says there hasn't been much in the way of research to substantiate whether these new strategies are actually working.

Which is where Stantec, an engineering and architectural design consulting company, enters the picture.

The company recently decided to consolidate its 230 employees, which were scattered among four older buildings around the city, in a new office at 311 Portage Avenue.

The new office space, located in the same building that houses the Alt Hotel, is considered a "green" building, which means it meets the latest environmental and energy design standards.

With the move, Stantec saw an opportunity to test whether a green building would perform better than the conventional offices they were vacating, and called Mallory-Hill to see if she was interested in conducting a study into the question.

Mallory-Hill jumped at the opportunity.

"We're very interested in (building) design's impact on human health and well-being," she says. "In Manitoba, the number of green buildings is growing exponentially, and we felt it was important to validate whether or not a green building really is better."

The study, which received seed funding in 2014 from the Natural Sciences and Engineering Research Council of Canada (NSERC), is now funded by Mitacs – a non-profit national organization providing research opportunities for post-secondary students.

In Phase 1, Mallory-Hill and her research team conducted a comprehensive evaluation of one of the company's older office buildings. The evaluation included employee surveys, observations, and physical measurements of the environmental conditions. In the second phase, the team analyzed Stantec's three other locations. The third phase, which will involve an evaluation of the new office space on Portage Avenue, will take place in two years, allowing employees time to fully settle in after their move.

Previous studies, carried out by various researchers, including Mallory-Hill, suggest that green buildings do out-perform older buildings. Those who work in green buildings tend to have better cognitive function and fewer sick days. Studies have also found that the air quality is higher in green buildings.

"Overall, self-reported health and productivity are higher in a green building," she says.

Nonetheless, even green buildings have issues.

"Generally speaking, the key green building problem seems to be acoustics," she says. "As we try to reduce materials acoustics become a problem. To increase daylight and view in offices, designers lower cubicle walls and provide more glazing, which creates more acoustic issues. High performance green buildings are often passively ventilated without fans that tend to mask unwanted sound."

In addition to Mallory-Hill, three students are working on the project, which is formally known as *Evaluating the Impact of Workplace Indoor Environment Quality on Employee Comfort and Wellness*. Since most of the students will become interior designers, the project is a rare opportunity to experience the life of a field researcher.

"I've always been interested in how the interior

environment affects productivity in the workplace. We're trying to prove that investing in high-quality environments is worthwhile," says research assistant Erns Wall, who joined the team at the beginning of November 2015. "Improvements in productivity are hard to measure because they require self-reporting. Cognitive function is a little bit harder to get at."

Wall is reviewing the literature compiled from Phases 1 and 2, and updating the information from previous students. "I'm a pretty good writer, so that skill fits in very well," he says. "Jack Shen, who has a sociology background, is in charge of the statistics. I'm very interested to look at how he does that. It will be a very handy skill to have going forward."

Umid Abdullaev worked as a technical research assistant in Phase 1, as well as a previous green building study, both of which involved taking measurements and compiling data in a busy office environment.

"It was really interesting to experience being an office worker from an observer's perspective," he says. "People got excited when they were told this research will be put into use in the future."

While Abdullaev feels that green buildings are best for employees overall, he did find some aspects that need improvement. "I've learned that open offices are not always the best thing. We came across high noise and stress levels," he explains.

Surprisingly, his results showed that air quality wasn't always better in a green building.

"Sometimes the air wouldn't be as fresh, and if you stay in a place with stale air, you get headaches," says Abdullaev. "Older offices wouldn't have new paint and furniture, so there was actually fresher air in some of the old offices."

Abdullaev says the findings underscore the importance of using low-VOC paints and compounds. VOCs, or volatile organic compounds, are organic chemicals that have a high vapour pressure at ordinary room temperature. This high vapour pressure causes large numbers of molecules to evaporate from the compound and enter the surrounding air. They can be found in many new building materials, including paint, carpeting, flooring, and furniture. Some VOCs are dangerous to human health or cause harm to the environment. Harmful VOCs are usually not acutely toxic, but can have compounding long-term health effects.

"It's not just a fad," Abdullaev says of the low-VOC materials. "It's something that actually helps people."

Mallory-Hill says she hopes to carry out more environmental testing of buildings in the future, adding that Stantec has expressed an interest in offering the service to its clients.

"We want to understand how buildings perform in-use so that employers can provide the best workplace possible. Stantec has been a big supporter of our workplace research."

The Green Team, from left: Umid Abdullaev, Shauna Mallory-Hill (with the IEQ Cart), Yi (Jack) Shen, and Erns Wall.

THE IEQ CART