



# Fraunhofer Project Centre for Biomedical Engineering & Advanced Manufacturing

An economic impact forecast assessment

# Executive summary

Hamilton has fostered the growth of an enviable life sciences cluster, supported by a formidable health research infrastructure and specialized research capabilities. While this focus has resulted in significant scientific advancement, the economic impact of this research is largely unrealized. To drive economic value, Hamilton must continue to make investments to bridge the gap between research and commercialization.

McMaster Innovation Park is a flagship initiative, aimed at fostering collaboration between industry partners and academia. Focused on maximizing the economic value of scientific discoveries, the Innovation Park provides incubation space, start-up services and commercialization support to researchers and the private sector.

Fraunhofer IZI, a German industrial research institute, has approached McMaster University to leverage these world-class Innovation Park facilities. These two partners will collaboratively establish a research project centre focused on biomedical engineering and advanced manufacturing.

This research centre will benefit from the trifecta of Hamilton's life sciences cluster, McMaster Innovation Park's state-of-the-art facilities and the depth of research expertise provided by Fraunhofer IZI and McMaster University. Through industrial partnerships, the project centre will promote collaboration between industry and academia, support commercialization and drive realization of the economic impact of research.

McMaster University engaged Deloitte to assess the qualitative and quantitative impact of the project centre to Hamilton, Ontario and Canada. Deloitte evaluated the direct, indirect and induced benefits resulting from job creation, talent development, commercialization and consumer spend.

This strategic investment in Hamilton's bioeconomy will promote commercialization, draw top talent, attract venture capital funding and grow Hamilton's reputation as the hub of health discovery. This synergistic cycle will ensure that Hamilton's life science cluster continues to flourish and grow for generations to come.

Research conducted at this project centre will develop talent, contribute to improving patient outcomes, promote knowledge transfer between academia and industry and serve as an integral antecedent for industrial R&D.

With a \$4M investment from the City of Hamilton, this project centre is forecasted to generate \$70M in economic impact for Hamilton. Additionally, the project centre will generate a \$5M and \$6M incremental impact for Ontario and Canada.



# The Fraunhofer Project Centre for Biomedical Engineering & Advanced Manufacturing

## Hamilton: A vibrant life science cluster with untapped economic potential

Hamilton is home to Ontario's second-largest hospital network and possesses a formidable health research infrastructure. This infrastructure has enabled Hamilton to build deep research capabilities by attracting top scientific talent and training the next generation of researchers. As a result, the magnitude of life sciences research has doubled in recent years and is receiving international recognition and prestigious awards.

While Hamilton has achieved enormous success in catalyzing research advancement, the economic impact of the life sciences cluster is largely unrealized. To support economic development, the city must bridge the gap between research and commercialization in this sector. Fostering industrial partnerships in a systematic manner will allow scientific discoveries to transition from bench to bedside. These innovations will attract top entrepreneurial and scientific talent, draw venture capital funding to Hamilton and grow Hamilton's reputation as the hub of health discovery.

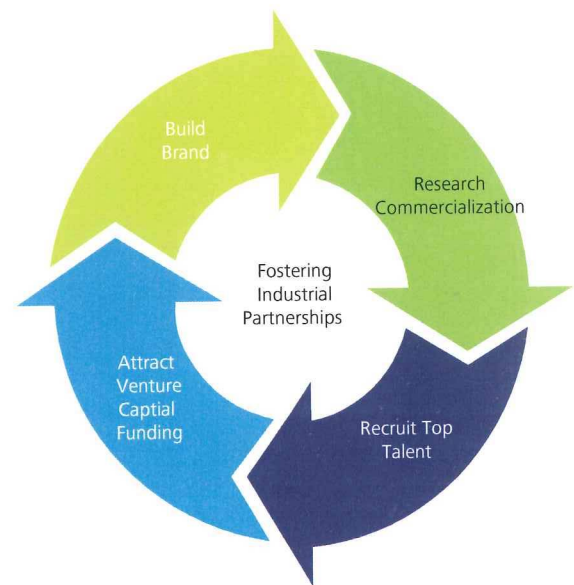
## A novel partnership between McMaster University and Fraunhofer IZI

To nurture partnerships between industry and academia, McMaster Innovation Park was established in 2009. This innovative research centre maximizes the economic potential for scientific discoveries by providing incubation space, start-up services and commercialization support.

As a testament to the international recognition this world-class research park has generated, Fraunhofer IZI, a German industrial research institute, approached McMaster University to establish a research project centre. This centre will focus on two areas of research:

- Automated micro-process development and instrumentation for the production of individual human cells for therapeutic applications
- Point-of-care diagnostics and biointerfaces for infectious disease management

This collaborative research partnership between McMaster University and Fraunhofer IZI will be catalytic in further developing the region's bioeconomy.



This synergistic relationship leads to job creation, talent development, commercialization success and a host of other economic benefits. As this cycle continues, the economic impact of the life science cluster grows and becomes exponential in time. Investments to cultivate this ecosystem will result in economic benefits to Hamilton, Ontario and Canada for generations to come.



# Assessment approach and assumptions

McMaster University engaged Deloitte to evaluate the quantitative and qualitative forecasted benefits of the Fraunhofer Project Centre for Biomedical Engineering & Advanced Manufacturing. Deloitte investigated the project centre impact to McMaster University, Hamilton, Ontario and Canada. Our approach and assumptions are outlined below.

## Approach

Key quantitative inputs were obtained from a variety of sources, including McMaster University, Statistics Canada, the Natural Sciences and Engineering Research Council of Canada (NSERC) and comparable economic studies. Direct, indirect and induced economic benefits were quantitatively evaluated over a 5-year period. These benefits are characterized as:

- Direct impact – effects that occur as a direct consequence of the project centre's operations and expenditures
- Indirect impact – effects that occur based on subsequent activity by external parties as a result of the original project centre's operations and expenditures
- Induced impact – effects that occur as a consequence of changes to the wages and salaries of the directly and indirectly impacted resources

Given the scale of the project centre, a multiplier approach was used to estimate induced impacts, instead of a detailed input-output assessment. These multipliers quantify the impact of a dollar circulating and re-circulating within the economy, magnifying the impact of the original expenditure. Industry-specific multipliers, developed by Statistics Canada, were leveraged to quantify the economic impact of:

- Construction on the project centre
- Researcher spend on scientific equipment and supplies
- Visitor and conference attendee spend
- Researcher family spend

Qualitative impacts were identified and evaluated based on discussions with McMaster University and Deloitte subject matter experts. Comparable economic impact assessments of Canadian universities were also leveraged to assess these benefits.

## Assumptions

The following assumptions were made in this economic impact forecast assessment:

- Quantification of all impacts generated by the project centre are not possible. Instead, this assessment focused on the inputs generating significant impact
- Taxes are linked to the level of government receiving the taxation
- Due to budget constraints, surveys were not administered to the impacted industries and stakeholders to determine spending patterns. Instead, inputs from a number of comparable economic assessments were leveraged for this assessment
- A 1% rate of inflation was applied to all relevant inputs
- Data obtained from comparable assessments and secondary sources was assumed to be accurate

# The Quantitative Economic Impact Forecast Assessment

The research advancement and industrial partnership activities of the project centre are expected to generate significant economic benefits to McMaster University, the City of Hamilton, the Province of Ontario and Canada. The 5-year cumulative impact of these quantitative benefits is outlined below.

## **Job creation, talent development and visitor attraction**

The project centre is expected to generate 74 direct jobs, including positions for highly qualified personnel, post-doctoral fellows, technicians and support staff. Many of these positions will be filled with talent from across Canada and internationally, who will likely relocate their families to Hamilton. As a result, an additional 28 indirect jobs are expected to be filled by the family members and partners of project centre employees.

Additionally, given the caliber of research that will be conducted at this facility, the project centre is expected to play a role in teaching and skills development. An estimated 30 graduate and 18 undergraduate students and 80 visitors are expected to attend training programs at the centre each year. Since many of these researchers will originate outside Hamilton, their expenditures are expected to provide economic benefit to the city.

## **Revenue generated by the Fraunhofer Project Centre**

The project centre's core activities will focus on research, innovation commercialization, industry collaborations, start-up support and training. Revenue generation from these activities over a 5-year period is forecasted to be \$29M from research grants and contracts, \$0.2M from innovation commercialization and deal flow, \$13M from industrial partnerships, \$0.5M from incubator space and start-up support and \$0.3M from conferences and training events. The \$43M in cumulative revenue generated over a 5-year period will have significant indirect and induced economic impacts on Hamilton, Ontario and Canada.

## **Economic impact to McMaster University**

Once the project centre is fully operational, it is expected to attract up to 18 undergraduate and 30 graduate students to McMaster University each year. This incremental increase in student population will generate a 5-year cumulative economic impact of \$1.2M to McMaster University in student tuition and fees. Additionally, the project centre could serve as a key differentiator for McMaster, attracting students interested in research opportunities in an environment closely tied to start-ups and the private sector.



#### Economic impact to Hamilton

The majority of direct, indirect and induced economic benefit from the project centre will be localized in Hamilton. Over a 5-year cumulative period, the project centre is forecasted to generate \$70M in economic impact. This impact will be derived from project centre operations, consumer spend and municipal taxes.

In its initial year of operations, an estimated \$16M will be required for project centre renovations and fit-out operations. This spend will be used for renovation materials, construction services and shared equipment and is forecasted to generate \$29M in direct and indirect benefit to workers in the construction, engineering, manufacturing and transportation industries. In subsequent years, project centre operations will generate cumulative revenues of \$0.5M over a 5-year period for local providers of equipment and supplies.

Talent directly and indirectly impacted by the facility will also contribute economic benefit to the city. Wages paid to project centre employees or to workers in industries impacted by project centre operations will be spent on a range of consumer goods, including groceries, transportation, and real estate. Over a 5-year period, researchers, support staff and students employed by the project centre are expected to generate a \$30M economic impact. Additionally, spend from indirect job creation, visiting scientists and conference attendees are forecasted to contribute \$10M to the Hamilton economy over the 5-year period.

Lastly, municipal property taxes from project centre employees relocating to Hamilton are expected to generate \$1M over the 5-year period.

#### Incremental economic impact to Ontario

In addition to the economic impact to Hamilton, the project centre is forecasted to generate an additional \$5M in revenue for the province of Ontario. Over a cumulative 5-year period, project centre researchers are forecasted to spend \$2M on suppliers outside Hamilton and the province of Ontario is expected to generate \$3M in personal income tax and provincial sales tax.

#### Incremental economic impact to Canada

The project centre is also forecasted to generate an additional \$6M in economic benefit for Canada. Over a cumulative 5-year period, researchers are forecasted to spend \$0.3M on suppliers outside Ontario and the federal government is expected to generate \$5.4M in personal income tax and federal sales tax.

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Over a 5-year cumulative period, the project centre is forecasted to generate \$70M in economic impact for Hamilton. An additional \$5M and \$6M is expected to be generated in economic impact for Ontario and Canada, respectively



# The Qualitative Economic Impact Forecast Assessment

In addition to the quantitative economic impacts outlined above, the centre will generate significant qualitative benefits. These factors will be integral to advancing Hamilton's bioeconomy and improving Canada's national competitiveness in science and technology.

## Research advancement and societal impact

Research conducted by the project centre will advance the fields of medicine, life sciences, bioengineering and biomanufacturing. Innovations emerging from the centre will inspire further research across Canada and internationally and will foster collaborations between researchers and between industry and academia. These interdisciplinary collaborations further our understanding of pathologies and lead to generation of diagnostics, therapeutics and treatment procedures. The culmination of these studies will improve patient outcomes and advance the quality of life for our society.

## Talent development and knowledge transfer

Talent development and knowledge transfer are crucial to ensuring that Canada's labour force remains competitive in the global knowledge economy. Education equips graduates with problem solving and critical thinking skills, increases the number of highly-qualified personnel (HQP) in the workforce and improves the productivity of the labour force. A university education is also associated with an estimated \$10,000 increase in earnings per year, contributing to broader economic impacts. Knowledge transfer from academic institutions to students also provides vital qualitative benefits. As graduates become industry employees, this knowledge is disseminated into the private sector and contributes to the development of more efficient processes and novel commercial products.

## Antecedent innovation and industrial impact

The Canadian private sector relies heavily on research conducted by universities, as a result of their smaller scale compared to US organizations. Canadian universities perform a high percentage of all R&D activities occurring nationally and industries leverage this basic research as antecedents for product development ranging from pharmaceuticals to biotechnology and nanomaterials. A prior investigation of US industrial patents found that 73% of all applications cited an antecedent paper developed by authors at public institutions, typically universities. While a similar study has not been done in Canada, this metric is expected to be higher given the lower industrial R&D capacity of Canadian organizations compared to US firms.

Research conducted at Canadian universities 'spills over' into the industrial sector and is essential in driving private sector advancements. There are several historical examples of this 'spillover effect', including Silicon Valley, Route 128 in Boston and the Research Triangle in North Carolina, where universities played essential roles in driving industrial R&D. The presence of a research-intensive university, such as McMaster, attracts R&D intensive industries resulting in a regional clustering, such as Hamilton's life sciences ecosystem.

# Conclusion

Fraunhofer IZI selected McMaster University over six other Canadian universities to house the Fraunhofer Project Centre for Biomedical Engineering & Advanced Manufacturing. This decision was based on the strength of Hamilton's life sciences cluster, its world-class McMaster Innovation Park and its breadth and depth of specialized knowledge in bioengineering and biomanufacturing.

The collaborative research partnership between McMaster University and Fraunhofer IZI will be catalytic in developing the region's specialized capabilities. To finance renovations and fit-out activities McMaster University requests \$4M from the City of Hamilton, \$8M from FedDev Ontario and \$4M from the Province of Ontario. Investment in this project centre will:

- ✔ Generate economic benefit to Hamilton – \$70M cumulatively over 5 years
- ✔ Generate incremental economic impact to Ontario and Canada – \$5M and \$6M respectively
- ✔ Strengthen industry and academia collaborations – 8 proposed industrial partnerships
- ✔ Drive commercialization and draw venture capital funding – \$0.2M in licensing revenue
- ✔ Attract top scientific and entrepreneurial talent – 74 direct jobs and 28 indirect jobs
- ✔ Develop the next generation of researchers – 30 graduate and 18 undergraduate students trained
- ✔ Attract visitors to Hamilton – 80 visitors each year

Investment into Hamilton's life science cluster will maximize the economic value derived from innovations and ensure the continued growth of the city's bioeconomy.

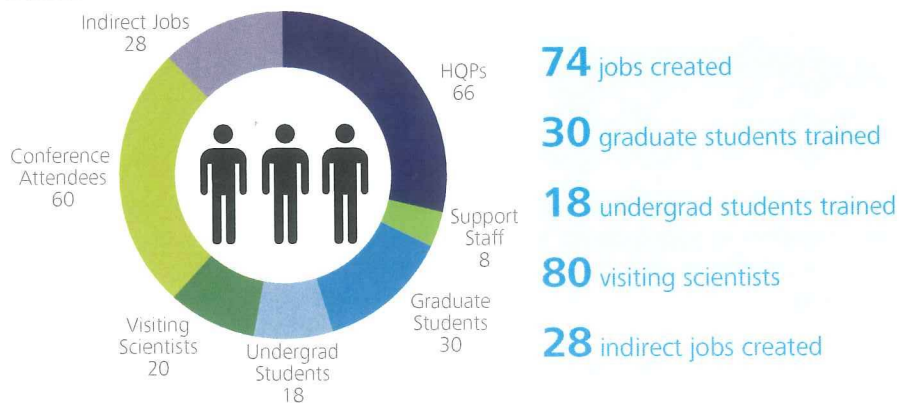


# Fraunhofer Project Centre for Biomedical Engineering & Advanced Manufacturing

## A 5-year economic impact forecast assessment

A collaborative research partnership between McMaster University and Fraunhofer IZI focused on point-of-care diagnostics and micro-process instrumentation for the production of individual human cells

### Job Creation and Revenue Generation



**\$29m** generated from research grants and contracts

**\$13m** received from industrial partners

### Quantitative Benefits

#### Hamilton

**\$40m**  
impact from consumer spend

**\$29m**  
from center renovations and research supplies

**\$1m**  
in student tuition & fees

**\$1m**  
in municipal tax

#### Ontario

**\$2m**  
impact from spend on Ontario suppliers

**\$3m**  
in provincial taxes

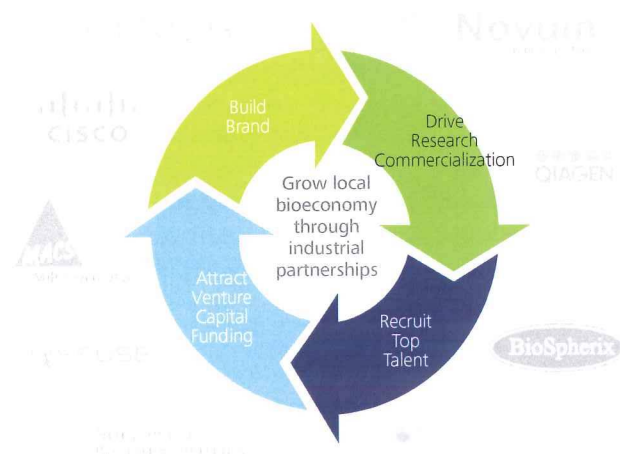
#### Canada

**\$0.3m**  
impact from spend on Canadian suppliers

**\$6m**  
in federal taxes

### Qualitative Benefits

#### Grow Local Bioeconomy



#### Improve National Competitiveness

