University of Calgary – Citizen Scientist Wearables Program – Update

RECOMMENDATION(S):

That the Priorities and Finance Committee recommend that Council receive this report for the Corporate Record.

HIGHLIGHTS

- Wearable sensor technology (e.g. smartwatches and activity monitors) is one of the fastest growing technology fields in the world. Calgary is well placed to be a global leader in research, product development and job creation in the sector. To meet a growing demand for qualified professionals, the University of Calgary (U of C) launched Canada's first wearables program in 2018 September called Wearable Technology Research and Collaboration (We-TRAC) Training Program. To support U of C's We-TRAC program, Council approved $57,500 from the Council Innovation Fund in 2019 Q4. The funding enabled the We-TRAC program to hire a local computer scientist to develop a web portal to allow Calgarians to sign-up to volunteer to take part in the program. As part of the funding agreement, U of C matched the funding and was tasked with working with The City to explore research projects that would benefit The City and Calgarians.
- *What does this mean to Calgarians?* For U of C students, they have access to data to conduct research to provide innovative solutions to real world questions. For Calgary companies, professionals with expertise in wearable technology are in high demand and low supply, the program and the database help train the next generation of experts in the field. For citizens, they can volunteer to take part in Canada's only university level wearables program, which can lead to better community health outcomes.
- *Why does it matter?* Calgary is looking to diversify its economy. Calgary's life sciences industry has been identified as an emerging cluster with high-growth potential in the city's latest Economic Strategy. As of 2020, Calgary is home to over 110 life sciences companies, with close to 60% of those identified in the medical devices and digital health sub-sector. In addition, the research provided through the We-TRAC program can help planners and engineers better plan and build our city.
- While the database and wearables program are in its early stages, over 500 Calgarians have volunteered and have uploaded over 140,000 hours of activity. The volunteer data is being used currently for 16 university research projects including:
    - Improving exercise strategies and adherence among cancer survivors;
    - Monitoring gait patterns and identifying risk factors for running related injuries;
    - Training load insights and injury prevention in youth sport;
    - Cyclist Green Wave Study – Coordinating Traffic Signals for Cyclists; and
    - Bow River Pathway study on Cycling Behaviours.
- Strategic Alignment to Council's Citizen Priorities: A prosperous city, and A city of safe and inspiring neighbourhoods
- Previous Council Direction: That the Priorities and Finance Committee direct Administration to report back to PFC indicating how the money was spent and outcomes of the projects no later than Q2 2021, as per the CIF Terms of Reference.

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DISCUSSION

Wearable Devices

Wearable technology such as smartwatches, activity monitors, and smartphones, have revolutionized the ability to collect scientifically valid biometric data regarding health and activity. Devices that were once used to track fitness are now being applied in many ways from navigation to monitoring blood pressure. This technology can provide university researchers with an unprecedented opportunity to better understand activity levels, mobility patterns and how environmental conditions effect health and wellbeing.

Wearables program at The University of Calgary

Researchers at the U of C are currently leading Canada's first graduate training program specializing in wearable technology; the NSERC Wearable Technology Research and Collaboration (We-TRAC) CREATE training program. The We-TRAC program is developing the next generation of wearable technology experts, focusing on using wearable technology to revolutionize sport performance, healthcare, health research, and now city building. The goal is to train upwards of 100 master's and PhD students from multiple faculties between 2018-2024. Students receive training in the biomechanics of human motion, data science, data visualization, knowledge translation, and entrepreneurship. The We-TRAC program is within the Faculty of Kinesiology and involves Schulich School of Engineering departments of electrical and computer engineering, mechanical and materials engineering and biomedical engineering; Haskayne School of Business; Faculty of Science's Department of Computer Science; and the Faculty of Nursing.

Funding Agreement

As part of the funding agreement with The City, the U of C had to:

1. Match The City's funding to build a portal where citizens can sign up to take part in various research topics

The U of C successfully matched these funds and hired a local computer scientist to build a secure portal for citizens to take part in the We-TRAC Program. The portal was completed and made publicly available in May of 2020. To date, over 500 Calgarians have volunteered and have uploaded over 140,000 hours of activity.

2. Work with The City in order to answer questions pertaining to transportation and urban planning. For example, understanding how people are using the pathway network, in order to build and improve the network.

University of Calgary researchers conducted a workshop with City staff in 2020 January. The workshop produced a variety of research topics that were categorized under the main themes below:

- Infrastructure for Active Modes (Running, Cycling, Walking etc.)
- Public Spaces (Sidewalks, C-train platform, school drop-off zones)
- Vehicle Infrastructure and Roadways
- Recreation Facilities
- Office/Workplace Employee Health

There are a series of potential research questions for each theme. For example: for the categorized theme of Infrastructure for Active Modes (Running, Cycling, Walking etc.) the following research topics of interest were identified:

- Perception of safe/unsafe routes (lighting, congestion levels)
- Desired routes vs Existing routes
- Commuter routes vs Leisure routes
- Perception of pathway quality, need for maintenance, snow removal etc.
- Differing activity levels by community/region of the city
- Physiological response to different routes, sections of pathway

There are currently 16 research projects that are using the database to answer questions pertaining to these and other topics. The We-TRAC program is ongoing, and U of C will research more topics over time as more students join the program.

The City's role

The City is not collecting wearables data or dedicating staff to this research. The City is providing research topic ideas so that students and researchers can answer questions that are meaningful for planning and City service delivery. U of C conducts research and shares findings with City Administration. The City can then utilize the research to create infrastructure and operating improvements e.g. making improvements to a section of pathway where data shows volunteers are physiologically stressed.

From an economic development perspective, by supporting and collaborating with the U of C program, The City is helping to foster training students and researchers that are part of a burgeoning field that will be part of Calgary in the new economy.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION (EXTERNAL)

☐ Public Engagement was undertaken

☐ Public Communication or Engagement was not required

☒ Public/Stakeholders were informed

☐ Stakeholder dialogue/relations were undertaken

The U of C worked with City staff to identify research questions that would benefit cities. U of C is engaging with the public and onboarding participants.

IMPLICATIONS

Social

There are several current and future research Social topics that could be undertaken by university students and researchers that could benefit the planning, development and operations of cities.

Environmental

There are several current and future Environmental research topics that could be undertaken by university students and researchers that could benefit the planning, development and operations of cities.

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Economic

The global wearable technology market size was valued at USD 32.63 billion in 2019 and is projected to expand at a compound annual growth rate (CAGR) of 15.9% from 2020 to 2027. This growth has been further accelerated by the COVID-19 pandemic where an increased reliance on remote patient monitoring technologies has driven adoption.

With regards to the City's ability to attract investment in the sector, access to a pool of highly skilled talent is a top decision-making factor. Distinct university programs, such as the as U of C's We-TRAC program, help provide the sector with the necessary Life Sciences-related skillsets. The We-TRAC presents researchers and trainees the opportunity to develop solutions in real-world situations responding to end-user needs.

Service and Financial Implications

No anticipated financial impact

$0

No additional City funding required. In Q4 2019, $57,500 from the Council Innovation Fund was approved by Council for the project. $50,000 of the funding was used to hire a local computer scientist to develop a web portal for Calgarians to volunteer to take part in the program. $7,500 was required for University Overhead costs. Note that the normal rate for research contracts is 25%. Through The City's Urban Alliance partnership, The City pays a reduced rate of 15%.

RISK

Data Privacy – the data collected by U of C contains an individual's movements and biometric data. If there were a data breach, the study's participant's personal information could be compromised. To mitigate this concern, U of C is storing the data in a level 4 database. Level 4 Security (L4S) is referred to as the most in-depth and highest security level technology for securing identities and identity documents. The City is not collecting or storing individual data. As per the agreement with U of C, The City will have access to an anonymized aggregate data that will also be open to public use. The City is anticipating acquiring and posting the anonymized aggregate data to The City's open data platform by 2021 Q4.

Lack of Participants – The success of the Citizen Scientist program relies on there being a statistically significant amounts of participants and data. The goal is to have 10,000 participants. Activity data sharing programs like Strava, to which users upload their workouts, have attracted over 42 million accounts worldwide and adds approximately 1 million new users every month.

ATTACHMENT(S)

1. None.

Department Circulation

General Manager/Director	Department	Approve/Consult/Inform