

The Contech Ecosystem in Metro Vancouver

Industry Whitepaper
July 2020

Authors

Lara Azarcon & Felipe Calçado



Introduction

This industry briefing summarizes a BCIT research project and report undertaken for Scius Advisory and the Vancouver Economic Commission (VEC). The briefing presents a snapshot of the emerging construction tech (“contech”) industry in Metro Vancouver, including active companies, their revenues and employees. The report also outlines potential barriers to further adoption and innovation.



GeoSimsCities

Construction and Technology

Construction is one of BC’s largest industries, employing over 230,000 people and accounting for some 8.7 percent of provincial GDP, or nearly \$19.9 billion dollars. Equally significant is Vancouver’s rapidly evolving technology ecosystem, which has emerged as one of our most important value-add sectors. Linkages between construction and technology remain limited, but opportunities abound for cross-industry connections. For example, construction faces a labour shortage of 17,000 workers in the Lower Mainland alone, and many technologies produced in Vancouver – spanning software to robotics – could help address this gap. Given that construction and operation of buildings is responsible for half of the region’s GHG emissions, not to mention 30 percent of the solid waste stream, these technologies can also help the region achieve its pressing climate and environment goals.

Construction technology, or contech, refers to the collection of innovative tools used during the construction phase of a project – including machinery, modifications and software – that enable greater productivity, reduce material waste and result in higher-performance buildings. This could mean semi-automated and automated construction equipment, various forms of software and, for the purposes of this study, some advanced materials and products.

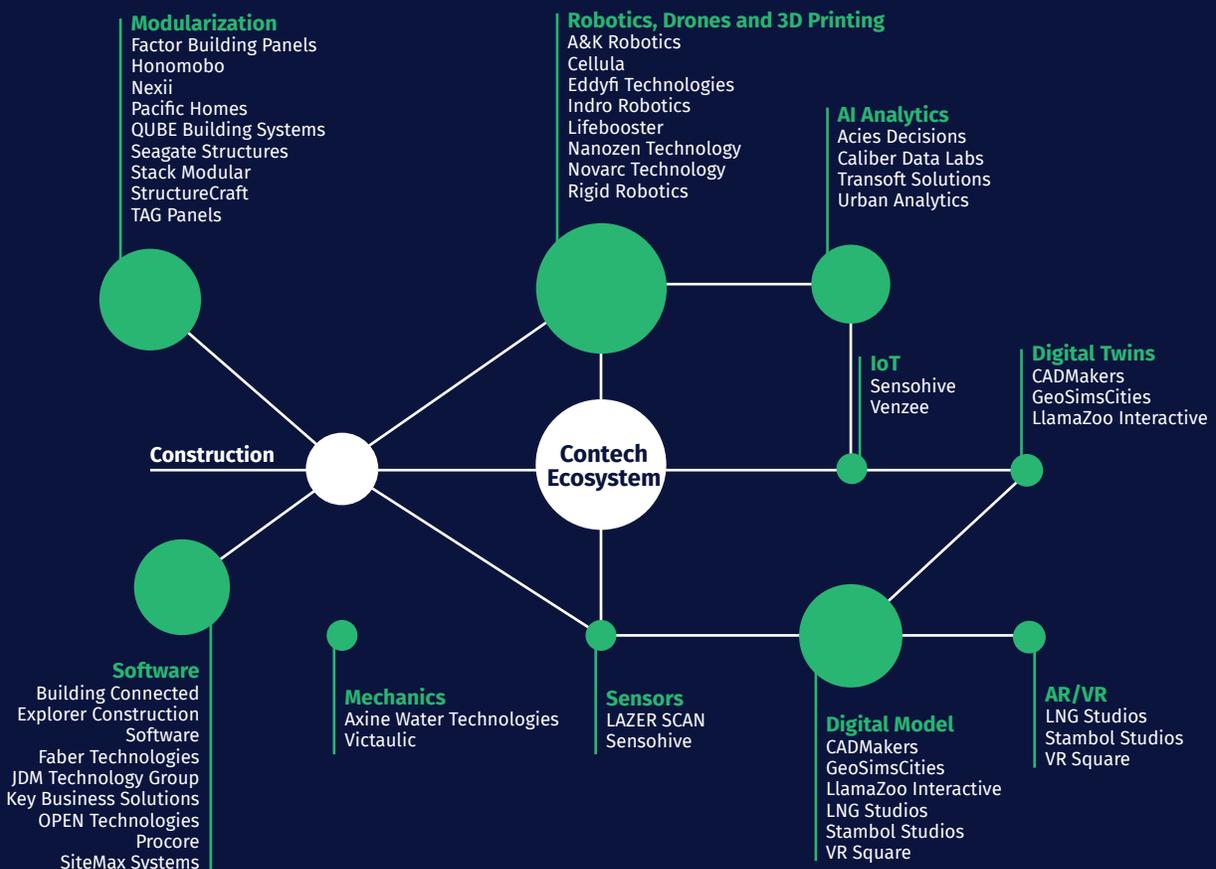
Highlight of Key Findings

The Contech Ecosystem in Vancouver

There are at least 66 companies in Vancouver that can be categorized as contech, with construction applications for robotics, internet of things (IoT), modularization, digital twinning, analytics and software development. In addition, there are nine publicly traded multinational contech companies with offices in Vancouver, including CAT Equipment, Oracle and General Electric,

all of which are established brands in the construction industry. Their impact significantly anchors the emerging contech cluster, energizes the local economy, and breaks down the barrier between innovative technology and the construction industries.

Figure 1: Contech ecosystem map
Metro Vancouver



Construction – Technology Linkages

Of the five major tech segments (many of which have overlaps or are cross-cutting nature) in Vancouver’s contech ecosystem – robotics and IoT, modularization, digital twinning and AR/VR, analytics and AI, and software development – some, including modularization and construction management software, are more directly linked to the construction industry.

Figure 2: Intensity of relationship to construction sector

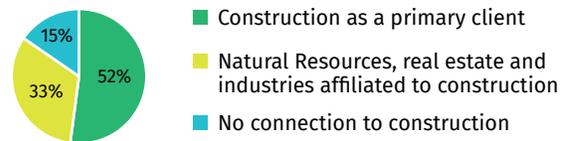
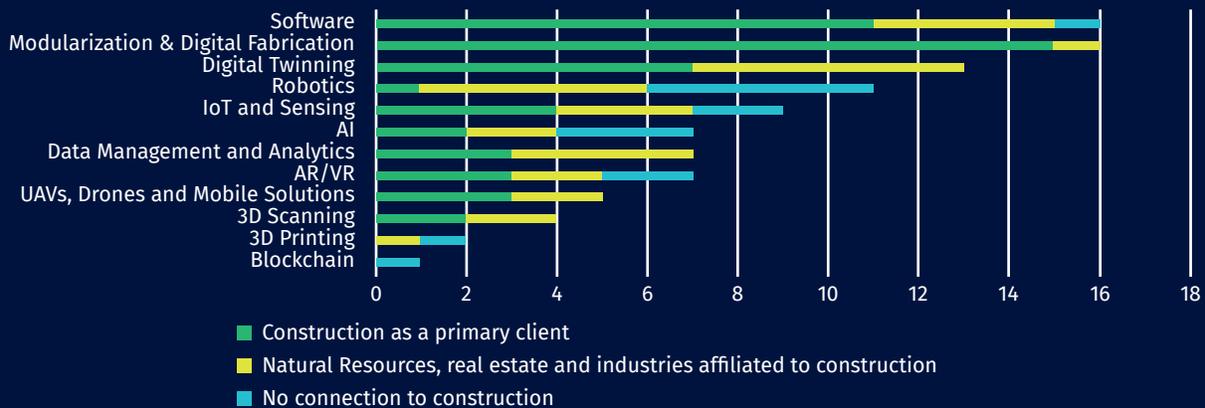


Figure 3: Distribution of contech sectors and target markets

Note: some companies operate in more than one sector



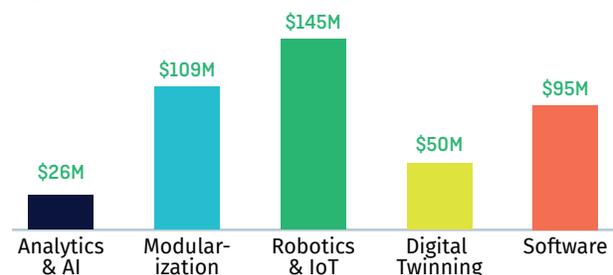
Contech Employment

There are at least 66 companies with an estimated 1,600 people working in Vancouver’s private-sector contech companies, with the largest number of workers in robotics, drones, and 3D-printing (460) and modularization (455). Unlike fintech, healthtech and other sector-specific technology clusters, contech is in the early stages of development in Vancouver, and strong growth and maturation require proper alignment with the whole of the construction sector.

Contech Revenues

The total revenues of Vancouver-based contech companies were \$426 million (CAD) annually as of March 2020.

Figure 4: Private sector revenue



Overview of Key Sub-sectors

Prefabrication and modular construction is the largest contech category by revenue. As of March 2020, the 10 companies in this category made \$101 million (CAD) in annual revenue and employed approximately 455 people. Prefabrication and modularization encompass factory-produced structural elements (such as mass timber or concrete composite panels), volumetric units (such as modular housing) and specialized “pods” (such as mechanical rooms, bathrooms etc.). Although modular building is not a new concept, manufacturing processes continue to evolve – accommodating increased levels of automation and other innovations – and one result is the evolving scope and complexity of prefabricated elements. Modularization promises high-quality products delivered on accelerated schedules and with predictable costs.

Data analytics, machine learning and artificial intelligence (AI) are represented by eight companies, including three that develop AI solutions directly relevant to construction. Data analytics helps businesses to

make informed decisions. Algorithms can be developed to automate processes, with applications such as development and evaluation of design options and management of building operations. Furthermore, several companies offer market data analysis and digital solutions in Vancouver. AI is relevant to construction because it can help machines react to the environment without human interference – for example, by autonomously analyzing data and solving problems – resulting in reduced errors and faster responses.

Currently, some small firms and local startups are active

in the market; however, larger companies like Oracle still dominate while offering a variety of services.

Advanced visualization and digital twinning technology is comprised of 12 companies employing 245 workers. A digital twin is a virtual replica of a physical entity. By bridging the physical and digital worlds with seamless data transmission, this application of spatial computing permits the virtual entity to exist simultaneously with the physical one. Digital twinning technology starts with the application of building information modelling (BIM) software that is adopted by the construction industry today, and extends to include augmented reality (AR), virtual reality (VR) and other advanced visualization systems that use GPS/GIS, telematics and machine learning. The technology can be further endowed with substantial and varied data sets related to fabrication, costing, energy efficiency, sequencing and asset management. There are several digital twinning companies in Vancouver, several of which incorporate digital twinning technology with VR/AR or sensing and IoT. Some digital twinning systems are also closely tied to unmanned aerial vehicles (UAVs) technologies.

OPEN Technologies

GRID by OPEN Technologies helps jurisdictions run energy benchmarking and disclosure programs, providing a data backbone to inform policy development in service of energy and carbon efficient cities.



Robotics, drones, mobile solutions, and IoT and its automation applications represent numerous opportunities for the construction industry, creating the potential to dramatically boost productivity and worker safety while filling critical labour shortages. As of March 2020, there are 25 companies operating in Vancouver in this sub-sector. Shifting from a craft-based manual process to factory-based production has the potential to significantly disrupt traditional construction. In the short term, robotics in construction is primarily represented by developments in unmanned or remote-controlled vehicles – on the ground and in the air.



Wood Innovates BC

State-of-the-art eight-axis industrial robotic work cell at UBC CAWP.

Robotics combined with IoT and sensing has tremendous potential for improving the construction process when applied to remote-controlled equipment. Remote-operated cranes and stationary equipment are becoming common, but when advanced sensing is combined with the latest in telematics, possibilities for fleet optimization and even driverless construction equipment – as envisaged by Finning Digital – come within tantalizing reach.

Several companies in Vancouver provide UAV or drone services. Some are strictly UAV companies, while others use UAVs in conjunction with ancillary technologies, such as digital twinning. These UAVs are used for surveying, construction monitoring for safety and contamination, and enhancing the bidding process and real estate marketing by providing ultra-high-quality images and videos. Numerous companies have developed UAV technology that can be applied to the construction industry, but they are currently oriented towards other industries, such as mining, oil and gas, aerospace, forestry and retail.

Software development is a mainstay of Vancouver's overall tech sector. Within it exists a diverse community of construction management software companies ranging from startups to large conglomerates; 14 are privately held and headquartered in Vancouver. Construction management software systems are firmly established in Vancouver (major players include Oracle and Procore), comprising the largest number of companies among the city's contech categories and boasting the third-largest source of revenue at \$88 million (CAD) per annum. The prevalent trend in this category is the shift from desktop-based, manual-entry software to app-based, cloud-computing software, as the industry demands more connectivity and ease of communication while handling increasing amounts of data.



Conclusion

VEC, Scius Advisory Services and the Vancouver Regional Construction Association (VRCA) continue to advance connectivity between traditional construction companies and the emerging contech sector. Better integration of contech within the building sector will assist with the realization of sustainability and material diversion goals while driving Vancouver's reputation as a global centre of excellence in all facets of the built environment.

Brought to you by

We would like to express our appreciation to all those who were interviewed and consulted with in the process of developing this report. We are grateful for the valuable and constructive insight provided during the planning and development of this research work.

Authors

Lara Azarcon | Co-Author

- Diploma in Architectural and Building Sciences/Technology, British Columbia Institute of Technology
- Sustainable Business Leadership Advanced Certificate, British Columbia Institute of Technology

Felippe Calçado | Co-Author

- Bachelors of Architecture, Federal University of Rio de Janeiro
- Sustainable Business Leadership Advanced Certificate | British Columbia Institute of Technology

Acknowledgements

Alan Shapiro

Faculty Advisor,
British Columbia Institute of Technology

Helen Goodland | Client

Director of Research and Innovation,
Scius Advisory Inc.

Albert Lam | Client

Project Coordinator, Scius Advisory Inc.

George Benson | Client

Sector Manager, Built Environment ,
Vancouver Economic Commission



About Scius

Scius is a Canadian advisory firm that brings transformative solutions for a rapidly changing world. We work with change makers in business, government and society to understand change, tackle their most important challenges and capture their greatest opportunities.

With a deep understanding of the real estate, construction, infrastructure and transportation sectors, we help determine the impact of local to global trends and make decisions that create a prosperous post-carbon future.



About the Vancouver Economic Commission

The Vancouver Economic Commission (VEC) is building a prosperous, inclusive and resilient economy for Vancouver, its businesses and its residents. As the economic development agency for the City of Vancouver, we strengthen Vancouver's thriving economy by supporting local companies, attracting high-impact investment and promoting international trade in the world's fastest-growing, low-carbon economy. VEC works collaboratively to position Vancouver as a global destination for innovative, creative, diverse and sustainable development.

We respectfully acknowledge that VEC is located on the unceded ancestral territories of the Musqueam, Tsleil-Waututh, and Squamish Nations.

Supported by

