

AI set to transform New Zealand's Building and Construction Industry

The building and construction industry is one of the country's largest sectors in terms of employment (250,000) and GDP, and while it has been slow to adopt new technologies, the rise of artificial intelligence (AI) is beginning to transform supply chain logistics and the way we design, construct and manage our built environment.

The COVID-19 Pandemic disrupted the global supply chain, and just the impact of delays alone was felt particularly hard in New Zealand as we rely on the importation of approximately 90% of all building products and materials. The building supply chain is complex because there are hundreds of thousands of building products that need to be sourced, imported and delivered to sites at the right time and in the right quantities. As a result, this has led to adding technology improvements to ensure greater resilience, diversification and productivity in the supply chain. However, there are challenges that building companies may face when introducing AI, most importantly being the cost of capital to transform traditional construction practices.

Post COVID shortages, New Zealand underwent changes to how much inventory of building materials it stored with a rapid increase in Distribution Centres and warehouses to cater for the surges in demand. Along with this was the adoption of AI and innovation into warehouse management systems (WMS) so that algorithms could better optimise inventory placement, monitor stock levels, manage warehouse space, and order fulfilment. Increasingly there are now more fully automated warehouses in New Zealand for building materials where there are no human warehouse managers on site.

Introducing AI into the supply chain is recognition of the need to boost the operational efficiency and profitability for any merchant, importer or organisation dealing with building materials. Optimisation of the supply chain primarily through automation of logistics delivers less costs, reduces fulfilment times, and importantly makes demand forecasting and procurement much more accurate.

Internationally, AI is being used to make construction processes not only more efficient, less wasteful but also safer to use. For example, AI-powered predictive maintenance can forecast equipment failures, minimising unscheduled downtime and reducing energy waste. AI-powered sensors can be embedded in building materials to monitor their condition and detect any potential issues which allows for the early detection of problems and enables proactive maintenance. India's Appinventiv, is a construction project management software that uses AI in construction processes to help companies better monitor project sites for potential hazards and address issues that prevent accidents. Planning is also underway where AI will develop smart building materials which 'self-heal' i.e. can repair themselves when damaged, as well as smart coatings which can adjust their physical properties based on environmental conditions, such as temperature and humidity, to improve energy efficiency and comfort. Ultimately these smart AI-powered building materials will reduce the need for costly repairs and maintenance.

The intersection of AI and sustainable construction offers a promising roadmap for a more sustainable future. AI is enabling for the design of greener materials and buildings, optimises construction processes, and manages resources more efficiently. However, to fully harness the power of AI,



this means the New Zealand building sector will need to be much more collaborative as successful implementation will need the cooperation of construction companies, through to technology providers, regulators and government agencies. There must be a willingness and vision to create an environment that supports and encourages capital investment and regulations that support the adoption of AI in building and construction.

One of the Government's recent reforms has been to introduce a Bill that will amend the Building Act to allow for the overseas certification of building materials meaning an expanded range of products that can be imported into New Zealand. While this ultimately will create more competition and downward pressure on prices, it also heralds the introduction of more innovation as well as alternatives to traditional materials like concrete, steel and timber.

Not surprisingly, AI is also at the forefront of developments in materials science and engineering. New generations of advanced materials are being researched as vast data sets and machine learning are accelerating the discovery and uptake of new materials as the old trial-and-error methods that can take years to assess are also eliminated. Machine learning uses algorithms with an inherent predictive capability that can simulate the performance of building materials under certain conditions such as seismic, temperature fluctuations, and environmental degradation to determine how good or effective these will be under real life situations. Furthermore, AI can also analyse a broader range of material compositions and structures than would be feasible by research teams to do manually, and so opens up exciting possibilities for entirely new classes of materials.

AI is already being used to determine the mix of concrete to produce a material that is not only stronger and more resistant to cracking, but also more environmentally friendly by incorporating recycled materials or reducing carbon emissions during production. Germany has used AI to develop concrete reinforced with carbon providing much higher strength and sturdiness than steel-reinforced concrete and this has been successfully implemented in bridge construction, demonstrating its potential to revolutionise infrastructure projects as well. In addition, AI has led to the improved production of aerogels used for thermal insulation which are more resistant to pressure and much easier to manipulate. These AI-enhanced aerogels are now being used in building envelopes and HVAC systems, significantly improving energy efficiency in modern constructions. According to an article in the publication Nature, AI could also drive the development of materials with unprecedented properties, such as ultra-lightweight composites or bio-inspired materials that mimic the adaptability of natural organisms.

AI will be pivotal to the demands of New Zealand's modern construction, allowing for stronger, more resilient, sustainable buildings, made possible by new building materials that deliver improved durability, and maintenance.



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