

CS463763

Technology Driving Sustainable Construction

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Learning Objectives

- Exactly how much waste currently comes from construction
- Discover how technology can help reduce the waste of materials during construction
- How contractors drive sustainability through technology
- Expose the potential market share of sustainable technologies

Description

As BIM & technology is further adopted around the world, the inherent benefits to construction have become obvious to anyone involved. Whether it's providing time savings, deeper project insights, reduced waste, or safer site conditions, the value is just waiting to be reaped. This class is meant to take a look at the value that technology provides and begin to think outside of the box. By compiling all of the other benefits and looking at them together, is there a common trend that emerges? Yes—efficiency. Technology driven workflows provide contractors and designers with exact quantities for materials extremely quickly, but way more importantly, models provide the right data, empowering intelligent, informed decisions. This improved decision making and precise information can reduce materials waste, reduce rework, and even reduce emissions produced by trucking things to the site. We will discuss all of this and more while we look at technology driving sustainability, including how industry leaders around the world are already seeing the benefits today.

Speaker(s)

Nate grew up in Rutland, Vermont. He attended the University of Vermont, graduating with a BS in Civil Engineering with a focus in structures. Shortly after graduation, he joined a BIM start up called Assemble Systems as their first dedicated application engineer, and went on to lead the Assemble team of engineers up until the acquisition by Autodesk, where he went on to become a Product Specialist. Outside of leading Assemble's application engineering team, Nate was responsible for the support and workflow development of Assemble's largest accounts, while also leading the international expansion of the product since the acquisition by Autodesk. It was during his travels abroad where he realized his passion for sustainability could be tied to his work in Building Information Modeling. He continues to look at new ways to leverage technology to offset unsustainable construction practices, while also driving efficiency and collaboration throughout the entire construction life cycle. Nate currently lives in Boston, Massachusetts and enjoys photography in his free time.

Introduction

This industry talk is meant to shine a light on the construction industry and its wastefulness. The construction industry around the world has operated for decades without sustainability in mind, and that's something I would like to see change. As my passion for sustainability has grown, so has my career, and as I traveled around the world meeting with different contractors, I realized not all of them ignored the environmental impacts of their business. During this talk you will hear about the current state of the world, the technology available to build smarter, and how companies around the world are leveraging that technology to make real change.

This handout is meant to provide a brief overview of the content I will be touching on and context for the greater presentation.

Current state of the world

Today construction contributes to a very large portion of the world's waste, and a very large portion of the world's emissions. 500+ million tons of waste in US from construction and 40% of global emissions and most of the waste is from demolition. The linear economy we live in leads to a make, use, dispose mentality and the demolition of existing buildings is the epitome of that. Things are not good, and a large disconnect from design to construction is the first thing that needs to change. Design build contracts are typically built ~105% faster than other contract types, and that's important because 75% of projects are at least 10% over budget. There are so many problems and the stem of those problems comes from a paper based disconnect process all around



Sustainable Technology

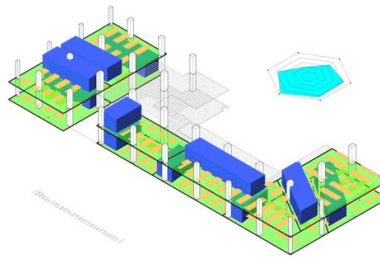
Technology isn't just computer software or hardware, it's innovative materials, new processes and practices, and inventive new products that help us work smarter and better. We look at biomaterials, prefabrication for building, generative design, BIM, and greening up a space. We also outline the market potential of green building and sustainable technology, which is in the hundreds of billions. All of this stuff leads to the bigger idea of a circular economy, similar to what we see in nature. Things grow, things live, things die, things decompose, their materials go back into the soil to grow again. Obviously this isn't one to one, but it is a zero waste system, not something that goes demolition its buildings just to build new ones.

Bio Materials

Bio concrete, bamboo, industrialized timber, and biofuels. Bio concrete heals itself with the help of bacteria that can live up to 100 years. CLT beams and engineered timber allows for safer, taller construction via wood. Bamboo is one of the fastest growing plants on the planet while being stronger in tensile strength than steel. Finally biofuel powered machinery and trucking can obviously reduce emissions of CO₂

Generative Design

Generative design is an Autodesk software that allows for the optimization of construction design and planning by using an iterative process against a set of parameters. By defining these constraints the program runs a simulation of all possible outcomes to optimize your design, allowing you to choose the one that fits best for your project. This could be planning for parking, solar path, wind path, or even layout of desk to make sure they are 6 feet apart..



BIM

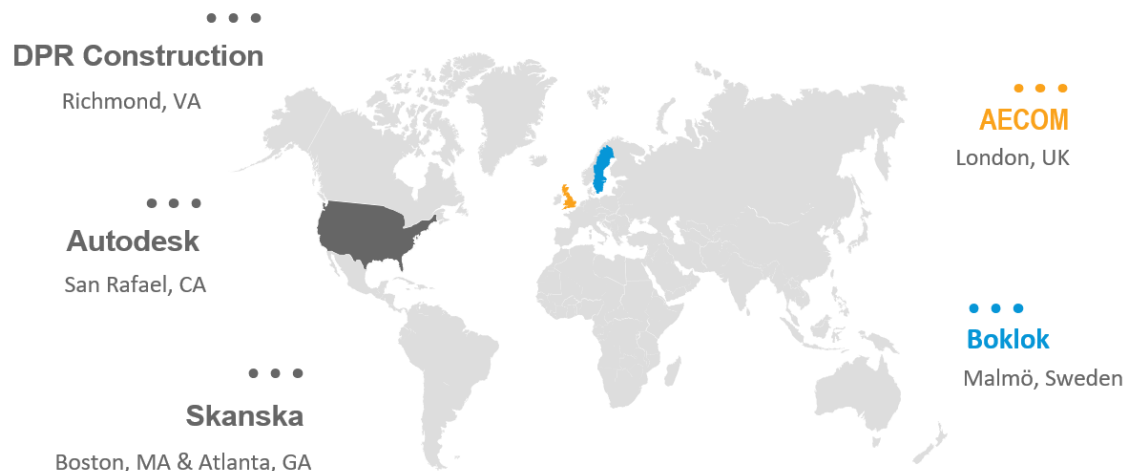
Building information Modeling (BIM) is the idea of putting construction information into a 3D model of whatever you are looking to construct. Typically done out of a tool like Revit, BIM allows for a much more accurate representation of a project than conventional 2D documents. This representation comes from the richness of data that lives within these models including location data, quantities, and can even include cost and schedule. One of the biggest use cases for BIM is coordination, making sure that everything from design is going to fit into the space required. This process can greatly reduce rework and change orders that come from site.

Prefabrication

Prefabrication is a commonly used process in the manufacturing process, and the same benefits and concepts can be applied to the construction process. When things are built off site and assembled modularly on site, projects tend to see great benefit particularly in their schedule. These concepts also drive lower emissions from travel to site and shipping to site, along with even safer working conditions. I expect to see a large increase in modular building and construction in the coming years

Industry Leaders

I had the pleasure of meeting with construction professionals around the world to interview them about their sustainable practices. I found varying degrees of environmental consciousness, and want to relate to everyone that the things I discuss aren't futuristic or science fiction, they are concepts and processes that are already being done today.



Skanska USA

Skanska construction is one of the biggest general contractors in the world, with offices operating in most urban areas in the western hemisphere. I spoke with Danielle O'Connell, and Kelsey Stein two professionals who have a decent amount of involvement with their sustainability initiatives. Skanska is setting the bar by having a sustainability team internally, being extremely forward thinking with technology, and involvement with Living Building Challenge projects along with universities.

SKANSKA

DPR Construction

DPR Construction is another large international contractor with a very large presence in the United States. I spoke with Langdon Lynch, a project manager about his use of technology and how it has greatly improved his teams performance on jobs with iterative installation. Langdon has embraced BIM and by using that BIM in the prefabrication and tracking process, reduced his onsite and shop waste to almost non, while greatly reducing project schedule and shipment to site.



AECOM UK

Another one of the biggest names in AEC, this time I jumped across the pond to discuss with the innovation and BIM teams at AECOM based in London. As the UK is extremely BIM forward, all of AECOM's design is in 3D, and they use these models as a library of parts when it comes to design and construction. This library of parts is enriched with construction information which automates the creation of this data as the model their projects. They also leverage Generative design, and have begun to get into the modular building sector as well.



Boklok

Finally I get to my star pupil, a smaller company based in Sweden called Boklok. They are a joint venture between Skanska and IKEA, and only build via modular. They were a company founded in sustainability, which their mission statement makes clear, but they are also grounded in social equality, as they want to make sure their housing is affordable to all. They are one of the most advanced companies when it comes to sustainability that I have ever talked too. Everything is modeled, and all projects in Sweden are mandated internally to include a solar

element. One project in particular we spoke about was even net zero carbon. Huge shout out to this team.



Shifting the Paradigm

What's the point?

1. The climate is an emergency, but there is still time to make a difference.
2. Construction is BAD, and I mean bad when it comes to sustainability.
3. Technology, innovation, and investment is the key to a brighter future.
4. Go check out and support USGBC, DBIA, Living Building Challenges and all the organizations out there that are driving green building practices
5. There is money to be made off sustainable tech and green buildings

Treat the Enviroment like a business

Think about the environment as a business, particularly when it comes to the allocation of resources. Even if you're a start up, you don't go using all your money and manpower without a company mission or goal you are looking to achieve. Even if you're using all your resources to grow, if not used thoughtfully eventually they run out and you crash and burn. But if you manage those resources by making informed decisions while keeping the future in mind, you have a much higher chance of being successful. I don't care what your company mission or goal is, if you work at a for profit business, you are here to make money, and to be successful for a long time..... Just like a new business venture, a sustainable future is going to take an investment to get started, along with a decent amount of buy in and manpower, But if we managed in this way I honestly believe we can all survive and more importantly prosper for generations to come.