Better Starts Here: Autodesk University 2019

CIMdata Commentary

Key takeaways:

- *Autodesk remains focused on their transition from perpetually licensing on-premise to subscription licensing their on-premise and growing cloud portfolios, with several important announcements at Autodesk University 2019.*
- *The company remains committed to manufacturing but sees their architecture, engineering, and construction (AEC) business as a bigger opportunity.*
- *The Autodesk Forge platform ecosystem continues to grow, with over 4,000 attendees at the one-day developers conference (DevCon).*
- *Autodesk continues pushing the boundaries of generative design beyond geometry for additive manufacturing to new manufacturing processes, and to new applications like site design and plant layout.*

CIMdata had the pleasure of attending Autodesk University 2019 (AU2019) on November 18-21, 2019 in Las Vegas, NV. According to Autodesk over 13,000 attendees participated during the nearly week-long event at the Venetian/Palazzo complex. This commentary focuses on key sessions, messages, and content from the event.

Travel and/or other expenses were provided by Autodesk."

Doing More with Less

For the last several years, Autodesk has beaten the drum on the major issues facing the global economy and how the PLM Economy[1] can help. In his keynote at AU 2019, Autodesk President and CEO Andrew Anagnost used the catchphrase "Better Starts Here" to drive home that Autodesk is already helping organizations worldwide to meet their objectives. Mr. Anagnost cited statistics that construction creates about 1/3 of global waste. He maintained that we can't keep doing this and have to fundamentally rethink the way that we build. He cited Autodesk solutions being used to help Marriott design and build their new Noman Hotel in Manhattan which, at 24 stories, he claimed to be the world's tallest modular hotel. Skystone, the Autodesk customer working with Marriott, is a small company that was thinking big, according to Mr. Anagnost. They used Revit to create a library of parts that can be configured on the cloud. For example, if you change the dimensions of a window those changes propagate across the design. These techniques have been used in mechanical design for years and AEC is trying to catch up. Modules are manufactured offsite, with much better quality and much less waste. All 168 modules will come on a container ship to the Port of New York, trucked in one-by-one to the building site. The onsite work is less and much more predictable, making it easier to stay on track, on time, and on budget. It also causes much less disruption to the neighborhood. The hotel will open in 2020.

As usual, Autodesk uses inspiring customers to make their case. Dr. Elizabeth Hausler, the Founder and CEO of Build Change (https://buildchange.org/), highlighted how Autodesk solutions are helping their nonprofit develop and rehabilitate housing that can resist earthquakes. Dr. Hausler claimed they have worked on over $1.5 billion in housing assets to date, impacting the lives of 1/2 million people. Build Change uses Autodesk Dynamo Studio to build rules driven design elements in Autodesk Revit. Dr. Hausler claimed that what once used

[1] The PLM Economy is CIMdata's phrase for the collection of software and services companies that help companies achieve their PLM objectives. CIMdata includes Autodesk in our measures of the global PLM market in several categories.

to take 3 people 4-5 days now takes one person three hours. Impressive results to be sure, but Dr. Hausler knows that there is much more to do. She cited statistics from the World Bank that over 3 billion people will be living in substandard housing by 2025. Autodesk gave Build Change $1 million several years ago and Mr. Anagnost chipped in another $500,000 during her remarks.

Executive Creative Director, Asa Kalama, of Disney Imagineering touched the inner nerd of every attendee with his story of designing the new Star Wars—Galaxy's Edge, a new attraction at Disneyland in California and Disney World that spans 14 acres in each park. Mr. Kalama claimed that this was the largest land expansion at any Disney park. 140 disciplines from around the world collaborated on the design, and that does not include the extensive collaboration with partners. According to Mr. Kalama, coordinating their efforts was made possible by using building information modeling (BIM), a concept long-championed by Autodesk and embodied in their solutions. Mr. Kalama's extended team developed and managed 600 different models for design, fabrication, and installation. They used virtual reality to collaborate and for clash detection, and other Autodesk tools to track progress in real-time. Mr. Kalama believes Disney pushed Revit to its limits. This is common at Disney, claimed Mr. Kalama, because their projects are so complex and unique they often bump up against the limits of their chosen tools. The most direct benefit of the shared BIM models? Speed. Mr. Kalama stated that their use helped them deliver one of the most complex attractions ever created months early. Many in the audience were surely imagining themselves playing chess on the Millennium Falcon, a full-sized, fully immersive element of Galaxy's Edge.

Mr. Nicolas Mangon, Autodesk Vice President for AEC Strategy & Marketing, opened the AEC keynote citing their on-going work with the Notre Dame Cathedral restoration in Paris, France. Autodesk is using point cloud data collected before the fire to create new models that will be made available to all involved in the re-construction efforts. This is a great application of Autodesk and other supporting technologies in restoring this beloved cathedral.

The first day of Autodesk University included two day-long specialized events. Mr. Jim Lynch, Autodesk Vice President and General Manager of Autodesk Construction Solutions, joined Mr. Mangon on stage and claimed there were over 3,000 AEC professionals at the Connect & Construct Summit, their largest attendance to date. Autodesk used this opportunity to announce their Autodesk Construction Cloud offering, the synthesis of four Autodesk products—Assemble, BuildingConnected, BIM 360, and PlanGrid—three the result of recent acquisitions.[2] Autodesk claims that "Autodesk Construction Cloud brings these solutions together, and with Autodesk's established design authoring tools, connects headquarters, office, and field teams to increase collaboration and productivity."[3] Autodesk is all in on the cloud and this new solution unites these capabilities on a common data environment based on BIM 360 Docs. Integrating acquired products is never easy but if this solution works as advertised it will be a boon to its customers. Mr. Lynch believes it will be a real game changer for AEC. CIMdata looks forward to Autodesk University 2020 sessions where customers relate how this new offering changed their games.

The Manufacturing Keynote was hosted by Mr. Greg Fallon, Autodesk Vice President, who opened by updating the crowd on two exciting partnerships. First, Autodesk is working with aPriori, a leading independent provider of product cost management solutions, to integrate their costing solution into generative design in Fusion 360. This adds an important gating factor to

[2] Assemble Systems in July 2018; BuildingConnected and PlanGrid in December 2018.

[3] https://adsknews.autodesk.com/pressrelease/autodesk-ushers-in-new-era-of-connected-construction-with-autodesk-construction-cloud

the other boundary conditions driving the search for optimal design solutions. aPriori is known for their deep understanding of manufacturing processes and integration of its capabilities with generative design makes perfect sense. The bigger news was announced as Dr. Ajei Gopal, the President and CEO of ANSYS, joined Mr. Fallon on stage. ANSYS, the global leader in the simulation and analysis market as measured by CIMdata, announced a partnership with Autodesk in September 2019 about lighting simulation but this new agreement is much deeper. The two men spoke about how the firms would collaborate to develop seamless interoperability between Autodesk Fusion 360 and the ANSYS Mechanical simulation portfolio. The last decade has witnessed a rapid expansion in the use of simulation and analysis (S&A) across the product lifecycle. In response to this requirement, Autodesk made a number of focused S&A acquisitions to build a nice portfolio. Linking with the much broader and deeper ANSYS Mechanical portfolio takes it to a whole new level. In addition, simulation is at the heart of generative design, helping assess those design alternatives on properties of interest. If Autodesk can harness the ANSYS portfolio to expand the reach of their generative solution it would be a powerful combination.

Later in the session, Mr. Stephen Hooper, Autodesk Vice President & General Manager, Fusion 360 took center stage. The world is moving to smart connected products, and electronic design helps make them smart. In 2016, Autodesk bought CadSoft, the providers of EAGLE, "the people's" ECAD tool, according to an Autodesk blog.[4] Mr. Hooper claimed Autodesk to be the first to build an integrated mechanical/electrical design tool, built upon a single cloud-based data model. The quick video illustrated the associativity of the physical and electronics views, with changes in one reflected in the other. Mr. Hooper went on to describe some exciting advancements in the Computer-Aided Manufacturing (CAM) segment, tracked by CIMdata for over 28 years. In 2013, Autodesk announced their intent to acquire Delcam Plc, a leading independent CAM solution provider. CIMdata wondered when Autodesk would leverage the core Delcam technology in the cloud and Mr. Hooper delivered. He claimed they took the technology underpinning PowerMILL—the third leading CAM brand in direct revenue according to our most recent survey for calendar year 2018—and integrated it into Fusion 360. While most applications are moving to the cloud, CAM has lagged, so this is an important announcement. One hopes other Delcam technology is soon to follow.

Mr. Hooper also spoke about the ANSYS partnership. He emphasized that ANSYS had open access to the Fusion data model. In its positioning, Autodesk puts the data at the center, in their case managed using a cloud-based data model on their Forge platform. The plan, in work for several years now, is for Forge to be the platform underpinning all three Autodesk business segments: manufacturing, AEC, and media & entertainment. The record crowd at Forge DevCon helps plant the seeds of their growing ecosystem. Autodesk is also working to enhance interoperability between their solutions, again leveraging Forge. Autodesk's Manufacturing executives hosted a separate media session that started with an important announcement. Several years ago, Autodesk spoke about integrating Inventor and Revit and at AU 2019 they claimed a product announcement is imminent. This capability will be very helpful to companies that want to combine mechanical CAD equipment models with the BIM data for the buildings into which the equipment is installed. Going forward, AutoCAD, 3ds Max, and Revit teams will have common protocols to work with Forge. The Forge platform itself has grown, with a network of over 1,000 developers according to Autodesk. Autodesk opened up their application programming interfaces (APIs) so that developers can access all of their services, and spoke about a wide range of applications, including viewing, translation services, and data storage.

[4] https://www.autodesk.com/products/eagle/blog/autodesk-acquires-eagle-qa-look-future/

CIMdata is impressed with the progress on the Forge platform but there is much more work to do given the breadth of Autodesk's target markets and solutions.

Another major topic at AU was generative design. Autodesk has promoted their work in this area for several years and have some great examples to show for it, such as their work with Airbus on airliner partitions. In most cases when people talk about generative design they are talking about optimizing the part geometry to meet a set of boundary conditions which often results in organic shapes best made using additive manufacturing. To be sure, Autodesk does a lot of work in this area, as do many of their competitors. What is different for Autodesk is applying their generative design technology to other types of optimization problems. Last year, they showed an application of generative design to site planning for a mixed use development. This year, Mr. Anagnost spoke about new work with Airbus to optimize a factory to install engines. Airbus had a triangular space in which to work, and wanted to optimize not just on logistics and flows and construction cost, but many other stakeholder criteria such as employee work conditions, customer experience, daylight, sustainability, lot efficiency, and flexibility. Just as with part designs flickered by in other presentations, this time it whirled through design options that fit into the triangular wedge available. This extension is exciting and shows the broader potential of generative design.

In conclusion, Autodesk University 2019 once again offered something for everyone. The Forge DevCon and AEC events showed the enthusiasm and rapidly growing ecosystems for these topics within the Autodesk customer and partner base. Their move to subscription is largely complete and, based on financial reporting, they have shown a nearly 30% year-on-year revenue increase through the first three quarters of the year. At AU 2019 we saw how they are building on Forge both to support their Manufacturing and AEC businesses, but to also span them as we saw with the Revit-Inventor interoperability announcement. They are buttressing their cloud strategy by leveraging key technical capabilities from acquisitions like Delcam and partnerships with organizations like ANSYS and ESRI. The future is indeed bright for Autodesk as they Forge ahead (pun intended) in the coming years.

About CIMdata

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