



communications

L-3 Communications Delivers 3D Manufacturing Information to the Shop Floor

The sixth-largest aerospace and defense manufacturer in the United States, with over \$15 billion in sales in 2009, and 66,000 employees, L-3 Communications delivers the cutting edge in innovation and manufacturing. With an eye on constant improvement in its operations, L3 Communications-West began to develop a strategy of introducing 3D into its shop floor operations in 2005 to build productivity, efficiency and profit.

As a company that is consistently delivering record growth, L-3 Communications' products for aircraft modernization and maintenance, C³ISR (Command, Control, Communications, Intelligence, Surveillance and Reconnaissance) systems and government services remain in high demand.

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L-3 Communications

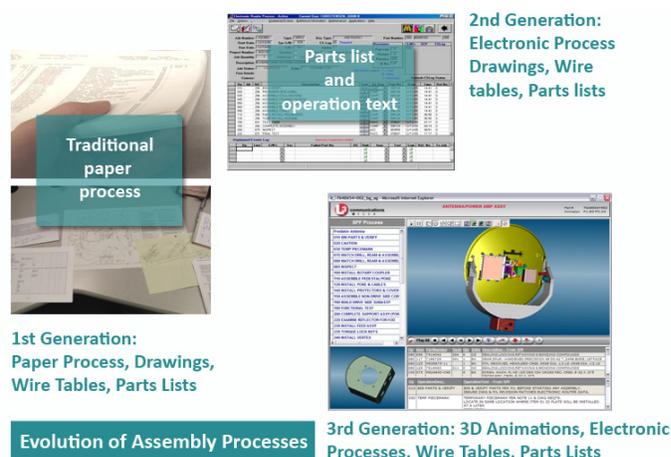


Figure 1: The evolution of L-3 Communication's workflow starting with paper-based information, to digital list data and the addition of 3D data assets

L-3 Communications Systems—West delivers the communications systems for high-performance intelligence collection, imagery processing for airborne platforms and satellite communications for government agencies. A user of the Solid Edge 3D CAD product for several years in the design departments, in 2005 the division started an initiative use its 3D data design assets in areas other than design. As part of its effort, the company adopted the use of Lattice Technology Solutions to be able to turn the 3D design data into 3D manufacturing data.

The project team that was formed by then VP of Operations, Larry Dietzler, consisted of two mechanical engineers, tasked with researching the tools available to deliver 3D to manufacturing in a way that would meet corporate needs and standards, paying close attention to cutting costs while increasing quality of the products.

"The aim of this initiative was to create an environment that meant less rework of the designs, faster and more accurate assembly, and fewer late engineering changes," commented Chris Dorich, an original member of the project team and later the Director of Transition Engineering at L-3 Communications. "Even more important was in finding a way of capturing critical knowledge that was leaving with retiring employees, and we had an idea that 3D might be able to assist with that."

The team researched a variety of different products, and, after a series of presentations and tests, adopted XVL and the software solutions from Lattice Technology – a 3D format that offers very high

Benefits

XVL Studio Pro, XVL Integration Toolkit and the XVL format enable L-3 Communications to:

- Successfully use a paperless schema in the design-to-manufacture process
- Build qualified products in 3D long before they are built
- Improve assembly processes by at least 6%
- Achieve at least 20% fewer engineering changes in products
- Improve design processes for better designed products prior to prototype
- Deliver shop floor information as a fully integrated part of the PDM
- Find 3D part data in seconds, as opposed to 2 weeks
- Capture disappearing legacy knowledge

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compression of 3D data, with applications that deliver innovative ways to quickly make that data relevant to downstream processes.

“The very high compression of XVL which makes 3D design data significantly smaller with no loss of accuracy, was a critical key to help us meet our needs,” said Dorich. “The XVL applications and format can also be integrated with IT infrastructures such as PLM and ERP systems, which was also a necessity for our strategy,”

The team selected various Lattice Technology Solutions including seats of XVL Studio which enables 3D data to be enhanced with process designs and accompanying 3D animations of each step in the manufacturing process, and the addition of integrated parts lists and other manufacturing information. This data saved into the XVL file can be rapidly viewed using the free XVL Player on PCs.

As a way to prove that this cutting-edge effort was worthwhile, L-3 conducted a simple test: they delivered a series of lego blocks to some employees with paper drawings of how to build the lego into a certain shape. To other employees, they delivered the same blocks with 3D assembly instructions in XVL. The first group of employees took 50 minutes to complete the desired shape. The employees using 3D XVL animations and work instructions took 30 minutes – a full 20 minutes faster.

As the team moved forward in its efforts, so it started to strengthen its 3D strategy to include a vision of a paperless schema in its design-to-manufacture operation. To enable this, it selected tools from the XVL Integration Toolkit which allow XVL data to be automatically and rapidly processed within PLM, ERP and other existing IT infrastructures. To handle the integration, the L-3 team opted to bring 2 developers in-house.

Flow of the manufacturing process

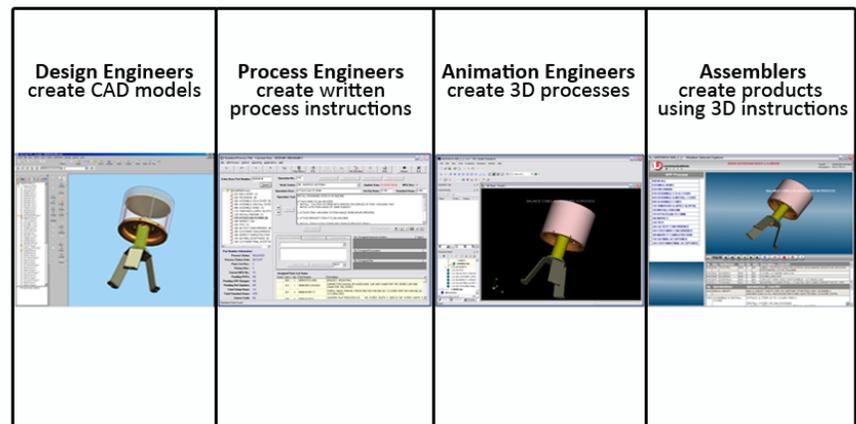


Figure 2: Team involvement in creating the 3D manufacturing data and using it downstream

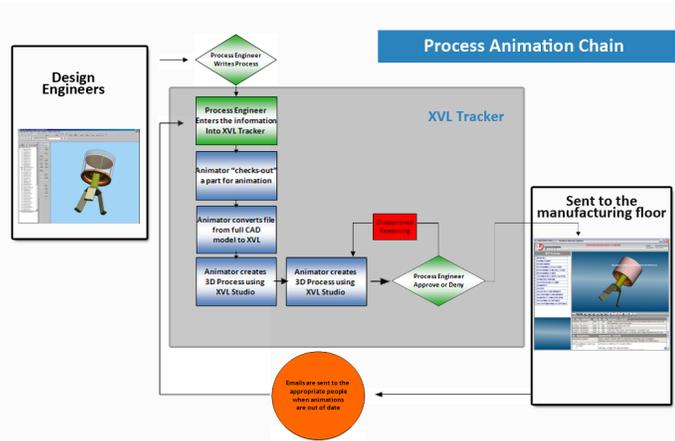


Figure 3: Workflow of data through the company's manufacturing database before arriving at the shop floor for the assembly staff

As a result, L-3 Communications—West now has a fully integrated system that automatically converts the 3D data from Solid Edge into XVL, enables access to that XVL data by animation engineers using XVL Studio, and then allows that enhanced manufacturing data to be fed back into the manufacturing database for immediate use on the shop floor. Manufacturing process engineers now regularly access the 3D data directly from the database to understand work processes, assembly instructions and, more importantly, be able to assess the processes long before the product is in manufacturing.

"We now have animation engineers who build qualified products in 3D long before they are built on the shop floor," said Dorich. "The shop floor staff access the information and start learning the processes required before production starts. This, as demonstrated by the simple Lego test, has started to improve our assembly processes, making them definitely more efficient."

As a by-product of this process, the L-3 team now also has a growing 3D database that is providing additional, unanticipated benefits. Called the Group Technology Program, this database is searchable using geometric features of parts to rapidly filter for similar parts and related information and metadata.

"This is really a very cool tool, and one we didn't actually plan much for," commented Dorich. "With a few keystrokes we can quickly and easily find parts that are similar, or identical, to the ones we want, rather than having to spend ages randomly looking through 2D drawings. In fact, we have gone from spending about 2 weeks looking for a single part to finding it almost instantaneously."

The parts found are used for up-front estimates to determine materials, labor and costs for a product, and enabling the engineers to accurately quote on a product even before a contract is in place.

Comparing the Metrics

Since L-3 Communications was pretty cutting-edge at implementing 3D digital manufacturing into its process, the team found that it was not well-prepared to be able to formally measure progress with the 3D paperless schema.

"We know that we have improved processes," said Dorich. "We have definitely seen improvements in assembly processes with about a 6% improvement, and in fewer engineering changes which are probably about 20% less than before, maybe more. We are definitely capturing the knowledge that was slowly disappearing as people retired. The barrier we hit though was that we had no prior metrics to use to compare to the 3D processes now in use, so all of our measured improvements are estimates."

In hindsight, the L-3 team realized that qualitative and quantitative metrics also change with the use of 3D in downstream processes.

Said Dorich, "As we started to place emphasis on using 3D data downstream, so the up-front design practices were improved. So were the better results in production a result of the better design? Or a result of the use of 3D parts lists and assembly processes downstream? We cannot measure that accurately."

Accepting 3D in the Enterprise

Predictably, uptake to 3D on the production and manufacturing levels was slow at first and met some resistance. For manufacturers whose shop floor staff have used 2D drawings for the entire corporate history, asking them to simply change to 3D is probably too great a step, at first.

The L-3 team realized the resistance and tried to plan out ways to address it.

"As 3D started to be made available on the shop floors, we started daily training and exposure sessions, showing people how to use it, the advantages and so on," said Dorich. "This is something we continue even now although more on a weekly basis, since acceptance of the systems has gradually and consistently increased. But it's a hard step for many to take."

The team also found that unexpected barriers arose in the IT departments, that were not convinced that 3D was going to provide the anticipated benefits envisaged by the team.

"If the IT department had been actively advocating 3D from the beginning, rather than later, it would have helped us progress a lot sooner," said Dorich. "We worked through it, of course, and they came on

board when they started to understand the strategy, but in hindsight, we could have done this part a lot better and needed better educational tools than we had at the time.”

For the Future

When they started this process, the L-3 team found that it was essentially inventing new ways to use design data, and found that it had a few false starts in its implementation of XVL into the paperless schema.

“We could have benefitted from a better understanding of where 3D fits into the product lifecycle, and since we did not have that information available we did waste some time working on 3D projects that did not have as much positive effect as we had hoped,” said Dorich. “As we learned more, we quickly moved into ways to use 3D that immediately had positive effects, but the learning curve was hard at first.”

In fact, it took the company a year to fully integrate XVL into its existing processes and IT infrastructure – longer than they had hoped. But even after achieving initial targets, further integration and usage has continued.

“We continue to find new avenues for using 3D knowledge to help our employees at all levels have a greater understanding of how 3D helps them, and make them able to contribute to a product’s success,” commented Dorich. “Having started down this track, people start to identify new areas where 3D could add value, and so it gets added in to the whole 3D strategy. Therefore we have since added more key employees into the team to propagate XVL and use its 3D atmosphere to the fullest.”

L-3 Communications—West continues on its track to gain advantage by using 3D across the enterprise. As was stated as an aim in its 2008 Annual Report they continue to “build on L-3’s place among the top performers in aerospace and defense.” The implementation of 3D as a downstream manufacturing tool definitely plays well towards helping achieve that.



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Lattice Technology Inc., sets the standard in Digital Mock Up and Technical Documentation software applications. These industry-leading applications are focused on making manufacturing productive, efficient and profitable through the use of 3D data. While creating 3D design data is the first step, it is not tuned to the needs of the shop floor, production, procurement or support staff, nor easily applied into these disciplines in its native formats. With Lattice Technology Solutions, manufacturers can use 3D to develop and share information across the extended enterprise, performing rapid process design, interference checks, assembly and motion simulations, creating mBOMs and sBOMs and then immediately use that data in standard documents for the extended enterprise.

The Lattice Technology Solutions deliver the information that has traditionally been delivered on paper drawings and reports, but as print-ready and digital documents that allow immediate cross-referencing of listed parts, work instructions and other annotations with the specific, relevant 3D data.

Customers of Lattice Technology have measured significant improvements in design accuracy, process design, as well as eradication of delays, and considerably reduced errors on the shop floor.

To find out more about the Lattice Technology Solutions, please visit www.lattice3d.com.

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