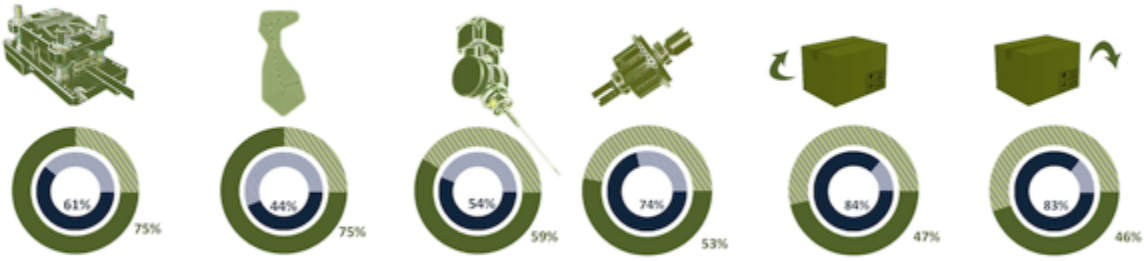
The 2013 State of 3D Collaboration and Interoperability Report



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LEGAL

INTRODUCTION

AN ORIENTATION TO THE STUDY AND REPORT

Have we finally realized the vision of fully leveraging the 3D model?

That's a question we've been asking for quite some time. While it may be many years before the answer is an unequivocal *yes*, it seems like we are making progress, slowly but surely. The purpose of this report is to measure just how far we have, or haven't, come.

In this document, you will find the statistical results of a survey laid out in a number of infographics. Accompanying them is commentary and analysis from subject matter experts, software providers and practitioners. Each provides their valuable perspective.

This report is broken down into three sections, one for each effort of initiative related to 3D models created by the engineering organization. The first focuses on design data interoperability, where design data is exchanged and translated between organizations. The second delves into model-based initiatives, where product and manufacturing information is embedded into the 3D model. Lastly, the extent to which the 3D model is leveraged outside the critical path between engineering and manufacturing is investigated.

Ultimately, we will all have differing opinions on just how far we've come in leveraging the 3D model. But like me, I hope you find the conversation just as valuable as any statistic.

Take care. Talk soon. And thanks for reading.

Chad Jackson, Industry Analyst, Lifecycle Insights
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TERMS AND DEFINITIONS

SETTING A BASELINE FOR THE REPORT

Computer Aided Design (CAD) is a type of desktop software used by engineering organizations to design and document their products. These tools are used to create digital and physical deliverables, such as **3D models** and **2D drawings**, which are then often released to manufacturing. Those deliverables are used to physically produce products. 3D Models can be built using a number of approaches, including **Direct Modeling** or **Modeling with Features**.

Design Data, which refers to 3D Models and 2D Drawings, are exchanged (**Design Data Exchange**) between customers, suppliers, partners and more. The files can be exchanged using many technologies and approaches, including **FTP**, **Cloud Sharing**, **Email** and **Physical Media**. Furthermore, Design Data can be accessed through **Product Data Management (PDM)** and **Product Lifecycle Management (PLM) systems**.

Because customer, supplier, partner and other organizations use different CAD software applications, Design Data must be translated between formats (**Design Data Translation**). Design Data can be exchanged between organizations in **Native Formats**, the native files of the CAD Applications, as well as **Neutral Formats**, which are exported into 3rd party formats. Alternatively, organizations can use **Translation Software**, applications to transform Design Data from one CAD format to another, or **Translation Services**, where the effort to transform Design Data between CAD formats is outsourced.

Model-Based Initiatives describe an effort to embed **Product and Manufacturing Information (PMI)**, non-geometric attributes of a design such as geometric dimensioning and tolerancing (GD&T), annotations and notes, surface finish as well as material specifications, into 3D Models. Such efforts have been associated with Drawingless Initiatives in the past, however, the creation of **Model-Based Deliverables** do not necessitate the elimination of drawings.

Computer Aided Manufacturing (CAM) is a type of software used by manufacturing organizations to generate NC tool paths and CMM paths, often based on a 3D Model. **3D Viewing** is a type of software used to perform various derivative tasks with 3D Models throughout the product lifecycle, but does not create them.

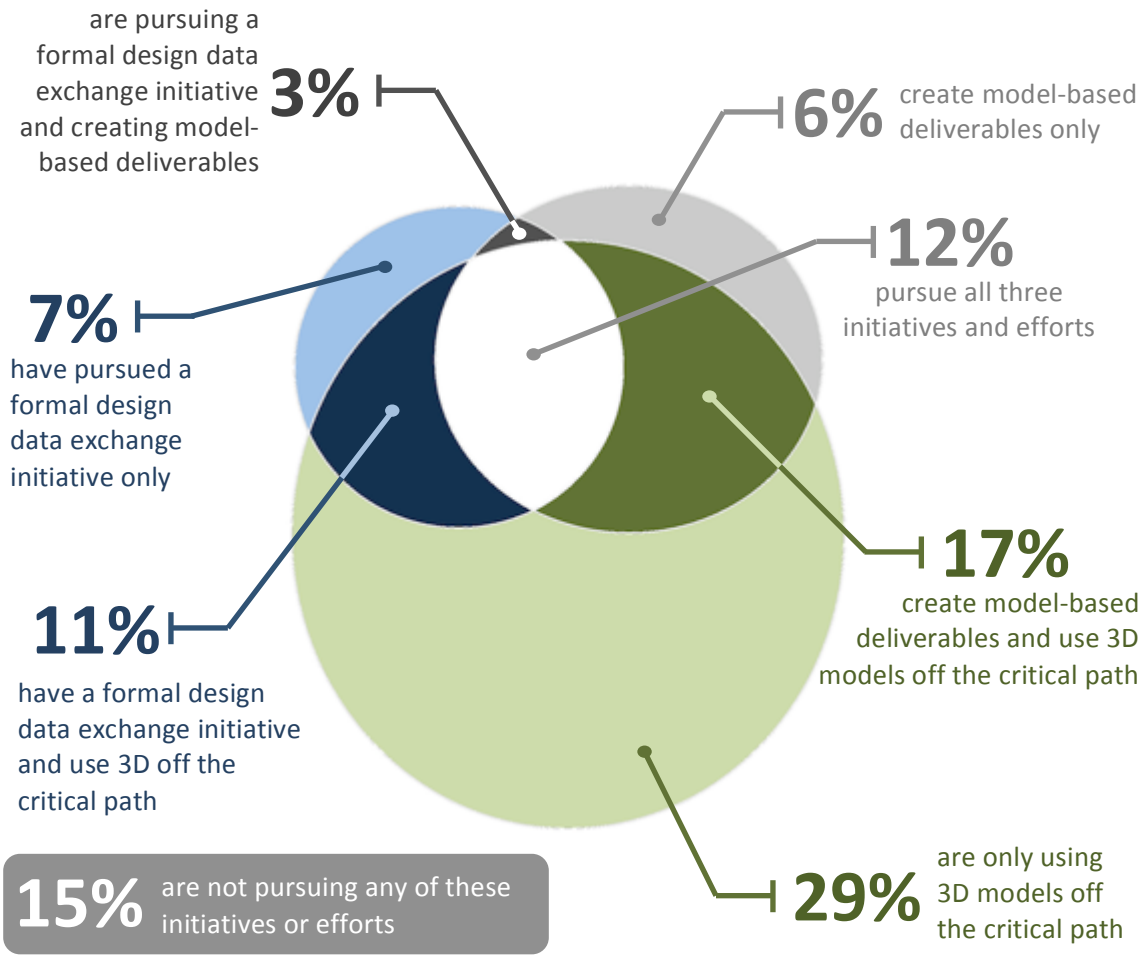
The phrase **'3D Models on the Critical Path'** refers to the use release of 3D models from engineering to the manufacturing organization, where the 3D Models are then used for production purposes. The phrase **'3D Models off the Critical Path'** refers to the use of these deliverables outside the handoff between engineering and manufacturing, including the use of 3D Models in service, quality, training, technical documentation, marketing, sales and other organizations.

THE LANDSCAPE
OF 3D-BASED INITIATIVES

of companies have a formal initiative to exchange design data

of companies use 3D models off the critical path

of companies create model-based deliverables



For us, remembering who gets what format and sending them as required is our only good option. Even within our primary CAD application, several vendors and customers don't stay updated, and since there is no retroactive version support, it causes headaches at times.

BYRON MORGAN, DESIGN ENGINEER, HUNTER DOUGLAS, CONSUMER PRODUCTS, UNITED STATES

I have to say, I'm surprised at how many companies are using 3D models outside of the engineering-to-manufacturing critical path. It's good that so many organizations are getting extended value out of something that engineering is creating anyway. Also, the findings imply there is a lot of synergy between these efforts, with 49% of total respondents pursuing at least two efforts or initiatives.

CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

I think it's clear to see that the value of the 3D model is increasing. Our vision of HD-PLM is focussed on helping companies get more from their investment in 3D models. Model Based Definition initiatives are a key approach to communicating design intent and extracting more value from the 3D model throughout the enterprise.

PAUL BROWN, MARKETING DIRECTOR, DIGITAL PRODUCT DEVELOPMENT, SIEMENS PLM

We make bad engineering decisions when we pretend that there are no interoperability problems. We have established a Center of Excellence (CoE) that has developed a definition of “core” data quality, designated a suite of tools for translation, and identified subject matter experts (SMEs). We feel this approach has provided a measure of success.

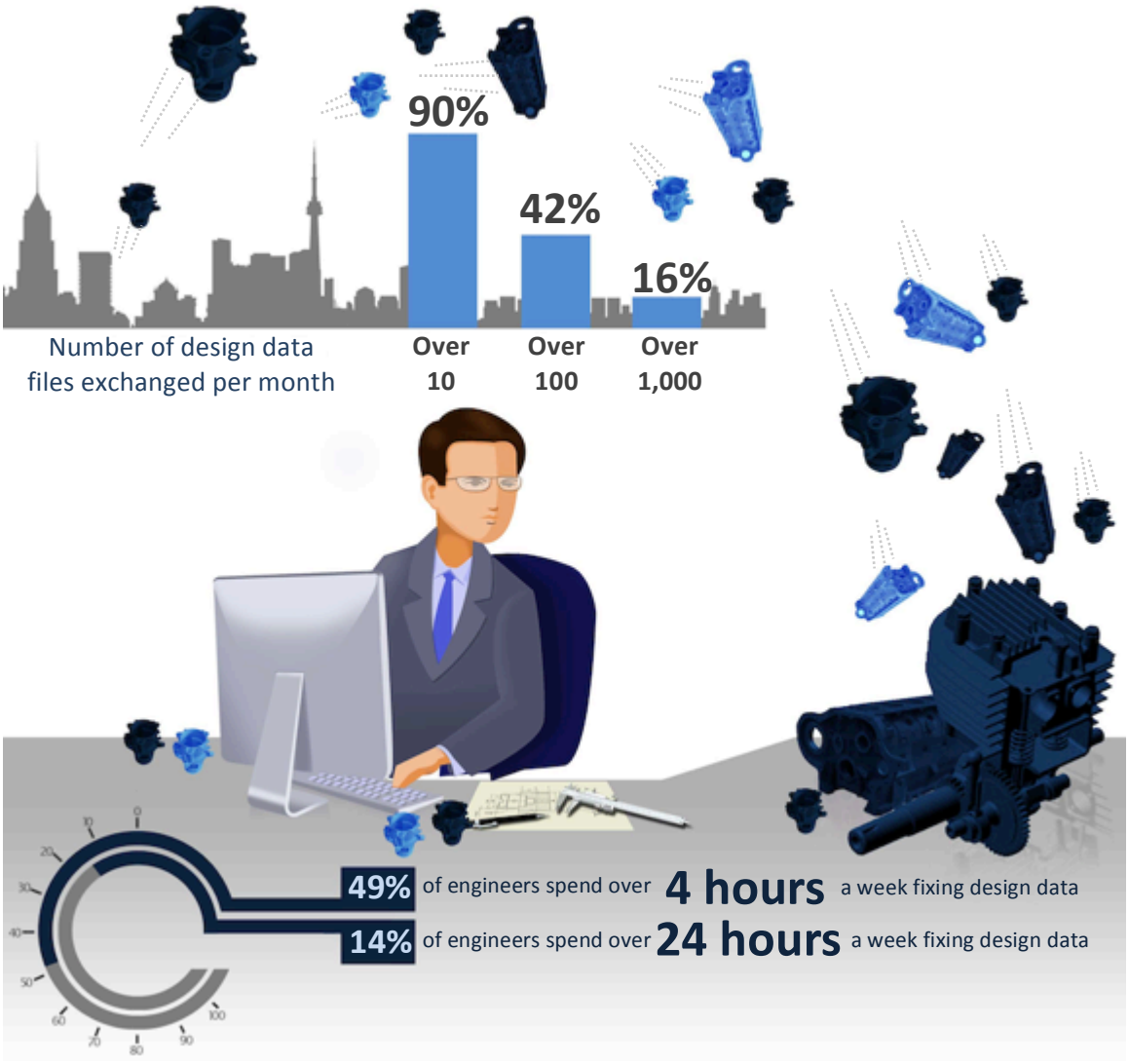
MATTHEW WICKHAM, DESIGN DATA EXCHANGE COORDINATOR, DELPHI, AUTOMOTIVE SUPPLIER, UNITED STATES

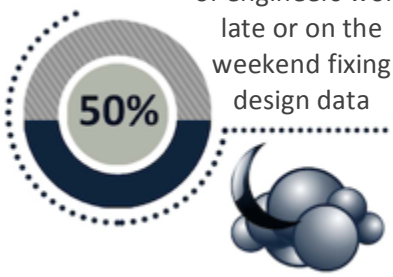
These results, when compared with past years of our report, show a continuously increasing trend toward more extensive use of 3D outside traditional design and manufacturing. This is really great news for many reasons. The largest benefit goes to those companies who are exercising the digital data outside the beaten path, as they are finding more ways to leverage their assets and innovate.

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

SCOPING & SIZING

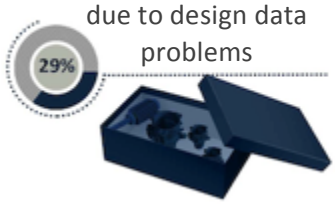
THE DESIGN DATA INTEROPERABILITY CHALLENGE





of engineers work late or on the weekend fixing design data

of organizations miss project deadlines because of design data problems



of organizations have ordered incorrect parts due to design data problems

Interoperability? There is none! Every automotive customer wants to see his own defined native format of his version of a specific CAD application. For years, there are initiatives to have standards, but in fact every department from OEM side is asking for native data (sometimes including check from third party checking tools). This causes a lot of administrative work to keep all the software levels accurate and also a lot of training for the CAD engineers.

STEFAN HARIG, STRATEGIC IT GROUP, SAARGUMMI TECHNOLOGIES, AUTOMOTIVE SUPPLIER, GERMANY

This is probably the most important metric, as it again portrays the highly publicized huge cost of poor interoperability. Yes, one might say we've been talking about this for a long time, but here's proof of the huge cost burden that still plagues suppliers and producers alike. Simple math shows the tremendous magnitude of the cost. And this is all non-value-added work, in lean terms. It is indeed surprising the number of companies who pride themselves in their lean operations who also ignore this cost and leave it to their engineers to deal with (on their nights and weekends). Wouldn't they rather have their people creating better products?

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

Although most of the vendors today claim that they have interoperability I think this is not a reality today. It can work if you are not going to modify the design, or will use it only as a context in a DMU environment.

MARCO CECCHINI, EMBRAER, AEROSPACE OEM, BRAZIL

Data clean-up after translation appears to be a significant effort for most companies, with 49% of engineers who responded spending over 4 hours a week working on it. At Siemens PLM, we are always looking at ways of optimizing geometry. Tools like Synchronous Technology contain optimization tools that will clean information, for example converting blend like faces that have been translated as b-surfaces into blends that can be modified and adapted. These tools can help reduce the amount of manual effort in cleaning data.

PAUL BROWN, MARKETING DIRECTOR, DIGITAL PRODUCT DEVELOPMENT, SIEMENS PLM

These findings confirm what I've suspected for some time. Yes, a lot of design data files are flying around. Yes, a lot of engineer's time is consuming in dealing with that. But there's no give in the schedule. It's just more work that needs to be done in the same amount of time. That's why engineers end up working late and on the weekend.

CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

COMMON EXCHANGE PRACTICES

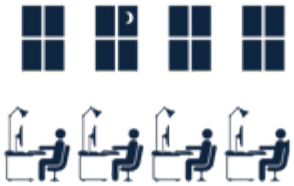
FOR DESIGN DATA IN THE SUPPLY DESIGN CHAIN

41% of engineering organizations have documented and formalized their processes and procedures to exchange design data

of engineering organizations are required to create design data in CAD applications specified by customers

of engineering organizations create design data in a single CAD application

of suppliers are required to create design data in specific CAD software

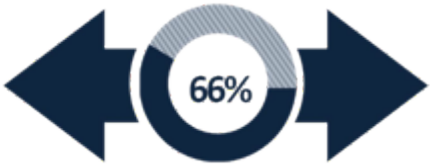


CUSTOMERS **ENGINEERING** **SUPPLIERS**

of engineering organizations exchange native formats with customers

of engineering organizations exchange native formats with suppliers

of engineering organizations exchange neutral formats with customers



of engineering organizations exchange neutral formats with suppliers

As we saw in prior findings, the heavy lifting of exchanging design data and collaborating on design work falls on the engineers themselves. And at the end of the day, in lieu of formal standardized methodologies for exchanging information, they will fall to whatever gets the most design work done in the least time (often on their nights and weekends). Although many people will tell you they support and use standards, they can often most easily exchange the data they need most in a native format. Standards must continue to evolve and become easier to use.

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

It (design data interoperability) continues to be a challenge for the corporation, but I do believe with modern processes and software tools it is getting better. We addressed it by setting up a dedicated data exchange service bureau that serves the company.

ANONYMOUS, AEROSPACE MANUFACTURER, UNITED STATES

The idea of CAD standardization is alive, if not quite as prevalent as it has been in the past. Furthermore, the idea of pushing a CAD standard down the supply chain is still in practice as well. The silver lining is that many organizations have gotten organized with formal and documented processes and procedures. As we saw before, design data interoperability direct affects the individual and the organization. It's important to have a strategy.

CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

I think it's interesting that despite numerous attempts at single system strategies by various companies a key part of doing business is to be able to handle data in neutral formats. That is one of the main reasons we invest in Synchronous Technology, and, one of the reasons why we focused on getting ISO certification for JT.

PAUL BROWN, MARKETING DIRECTOR, DIGITAL PRODUCT DEVELOPMENT, SIEMENS PLM

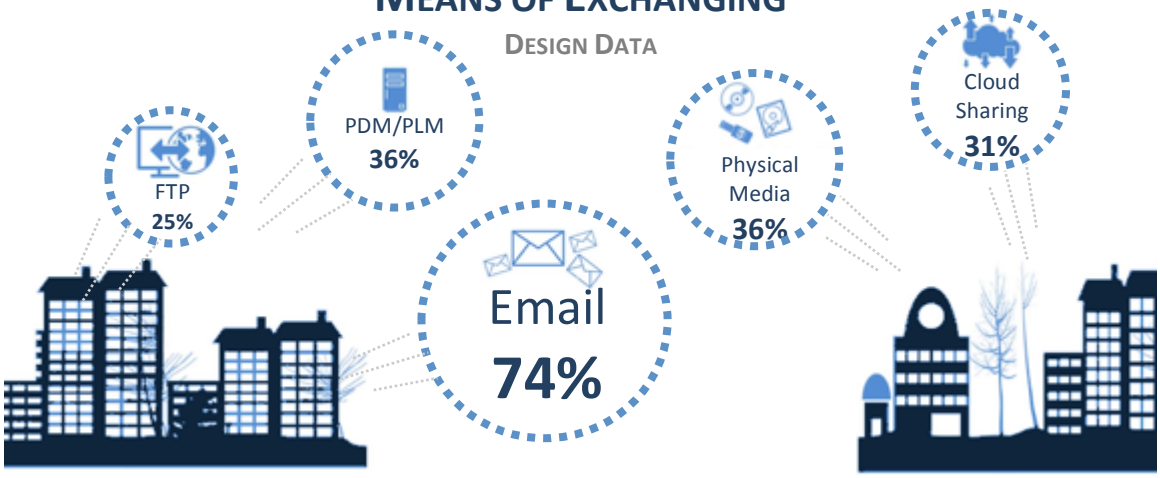
The design data interoperability issue is as bad as ever. Technologies are improving, but too few companies are willing to adopt them for variety of reasons. Standardization between Customer and Supplier CAD exchange is a major issue also, specifically between Tier 1 suppliers and their suppliers while the OEM's typically force the CAD standard. This causes conflicts for internal efficiency gains, needing to translate or re-translate data authored for one package to the package of the customers choosing.

SEAN MORRIS, SYSTEMS ENGINEER, DANA CORPORATION, AUTOMOTIVE SUPPLIER, UNITED STATES

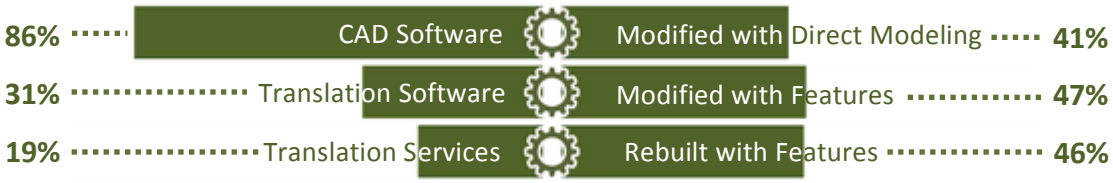
ENABLING TECHNOLOGIES

IN DESIGN DATA INTEROPERABILITY

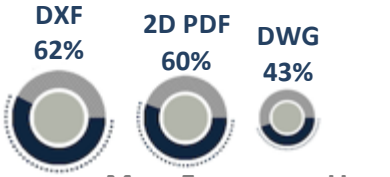
MEANS OF EXCHANGING DESIGN DATA



MEANS OF TRANSLATING DESIGN DATA

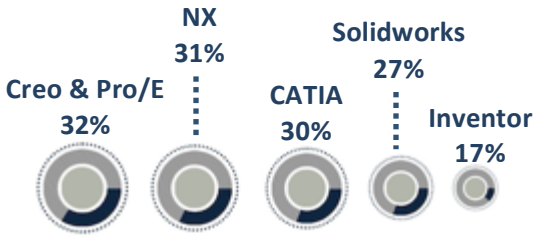


MEANS OF MODIFYING DESIGN DATA



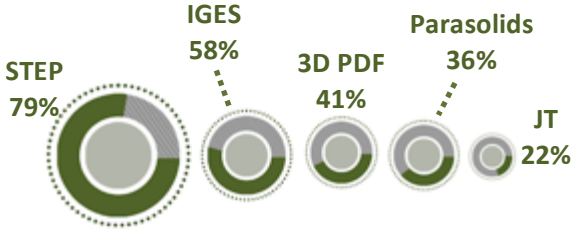
MOST FREQUENTLY USED

2D FORMATS



MOST FREQUENTLY USED

3D NATIVE FORMATS



MOST FREQUENTLY USED

3D NON-NATIVE FORMATS

The quality of transfers has improved slightly over the last 15 years with STEP being the primary format. Our biggest successes have been with the recent trend of direct modeling.

TONY PARKER, COMPUTER SERVICES MANAGER, FERMILAB, PHYSICS RESEARCH LAB, UNITED STATES

Two things strike me in this set of findings. First, the most frequently used means of sharing design data, which is frequently in native formats, is email, which is not a secure sharing mechanism. Second, Direct Modeling approaches, which offer new tools to heal and change imported data, are becoming widely used. That should cut back on some of those late nights and weekends at work for engineers.

CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

While it is clear that the translated data in the design process is high, the amount of modification of translated data remains quite low. A surprisingly high number of respondents 46% rebuilt models with features when they needed to make changes.

Using tools like Synchronous Technology time spent rebuilding models as feature models can be reduced and in many cases eliminated as it offers more power to recognise relationships and common geometric shapes (holes, pockets, bosses, blends) at the time of edit, than simple direct modeling. This allows users faster ways of modifying imported geometry as needed.

PAUL BROWN, MARKETING DIRECTOR, DIGITAL PRODUCT DEVELOPMENT, SIEMENS PLM

Over the last twenty years, the challenge of design data interoperability has changed in nature with the reduction in diversity of CAD tools. The bigger challenge lies in the interoperability of PDM systems, which are often closely tailored to a specific organisation. Further complexity arises from their links to manufacturing and product support tools, which are also highly tailored and diverse, as well as having to hold information for extended periods, often measured in decades.

HOWARD MASON, CORPORATE IT STANDARDS MGR, BAE SYSTEMS, AEROSPACE SUPPLIER, UNITED KINGDOM

It's interesting to note the large amount of design data translated with the CAD software. As much of this capability is licensing from translation software vendors, it appears these companies are benefitting from their OEM licensing strategies. I am pleased to see an increased dependence on features in the process. This suggests the feature-based technology is meeting the requirements, and companies are trusting their business partners enough to share feature information.

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

MEASURING ADOPTION

OF MODEL-BASED INITIATIVES

Companies voluntarily creating model-based deliverables

Companies contractually required to create model-based deliverables

Companies not creating model-based deliverables

Companies serving the Aerospace & Defense industry

63% create model-based deliverables

76% contractually required to create model-based deliverables

Companies serving the Aerospace & Defense and other industries

52% create model-based deliverables

77% contractually required to create model-based deliverables

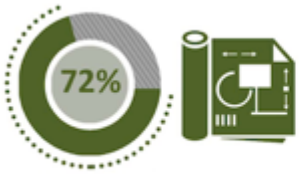
Companies not serving the Aerospace & Defense industry

34% create model-based deliverables

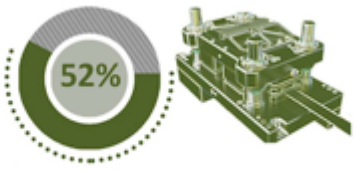
77% contractually required to create model-based deliverables

MOST PREVALENT APPLICATIONS

OF MODEL-BASED DELIVERABLES

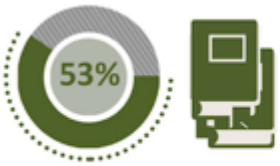


Create engineering drawings

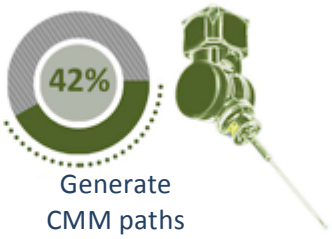


Design tooling and fixtures

Generate NC toolpaths



Author manufacturing documentation



Generate CMM paths

Author quality documentation

Model-based initiatives are certainly on the rise. This is good news for everyone. It typically takes mandates to win adoption of these types of methodologies, but whatever the reason, every stakeholder will benefit. I am pleased to see significant usage in many areas of downstream manufacturing. Gaining foothold in these domains will assure these techniques become embedded in a growing number of mission critical applications, ensuring their future.

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

We look at drawingless initiatives as a reduction in duplicated effort and preservation of design intent. Everything created after the model and PMI is duplication, including every drawing, op sheet, cut path, tool design, inspection plan, and report that requires effort to recreate existing data in a different format. There is cultural resistance to 3D only definition.

SCOTT MCAFEE, CHIEF OPERATING OFFICER, LEVEL 3 INSPECTION, ENGINEERING SERVICES, UNITED STATES

As expected the primary driver for the use of model-based initiatives is the Aerospace and Defense industry, however, we do see an increasing usage in the Automotive supply chain. There appears to be significant opportunity for many companies to explore other uses for the model-based information they are adding to their models. Results suggest that it is common practice to inherit the annotation onto a drawing, tools like NX offer the opportunity to drive downstream processes, such as NC and CMM inspection with this data, and that could significantly increase the return on investment in investing into model based definition to the organisation.

PAUL BROWN, MARKETING DIRECTOR, DIGITAL PRODUCT DEVELOPMENT, SIEMENS PLM

It's difficult to measure the value of Model-Based Design programs. Small productivity gains in one area (singular, synchronous datasets) can easily be lost to inefficiencies elsewhere; such as Planning's need to create assembly work instructions without drawings or redefining the Quality department's process of inspection without prints (with CMMs and Faro arms) or digitizing the production floor with kiosks and up-leveling the production workers 3D/computer literacy and subsequently their hourly bill rate. These are all examples of downstream processes that are adversely affected by the removal of 2D prints from the production process. If all downstream processes are equipped to deal with 3D datasets only, then the MBD program can have potential gains.

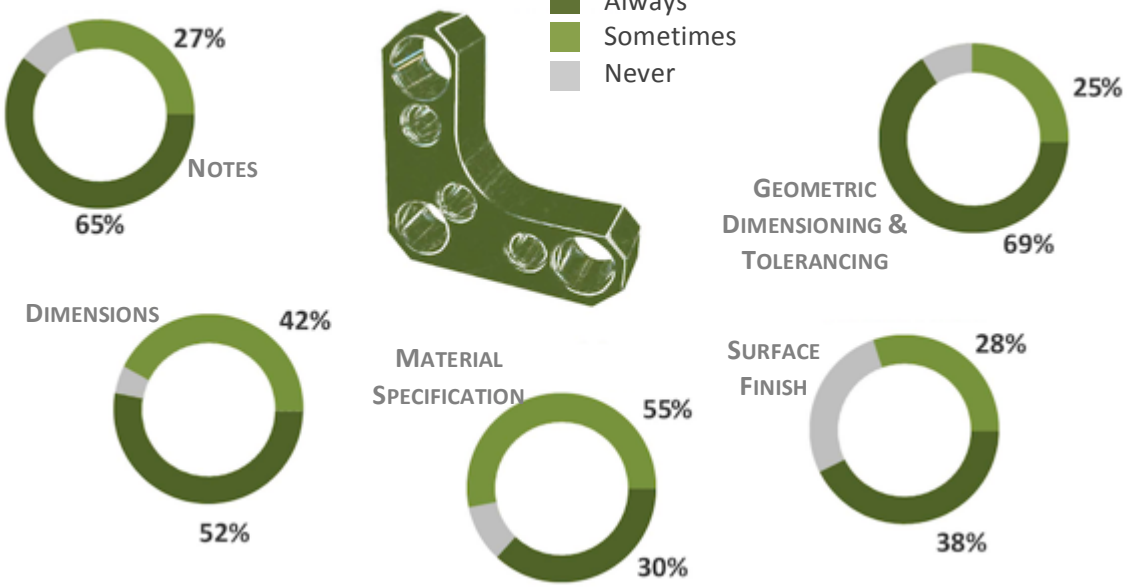
BRETT FONTAINE, DIR. OF ENG. SUPPORT SRVCS., ZODIAC AEROSPACE, AEROSPACE SUPPLIER, UNITED STATES

The aerospace and defense community seems to be the vanguard adopting model-based initiatives, even if it is because of contracts. It's disturbing, however, that many are doing so little with model-based deliverables. It's a missed opportunity to get extended value out of something your customer is forcing you to do anyway.

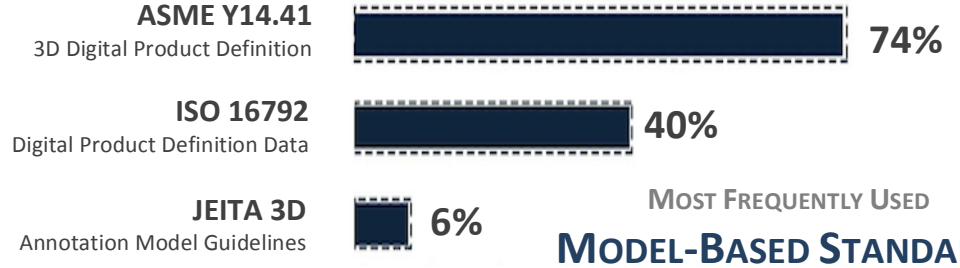
CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

ENABLING TECHNOLOGIES
OF MODEL-BASED INITIATIVES

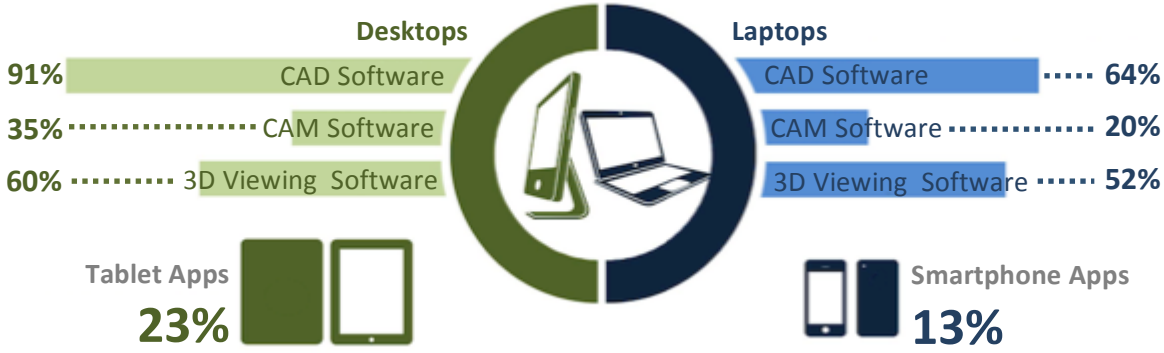
MOST FREQUENTLY CREATED TYPES OF PMI



MOST FREQUENTLY USED MODEL-BASED STANDARDS



ENABLING SOFTWARE
OF MODEL-BASED INITIATIVES



Model Based Definition will reduce costs required to detail 2D drawings. Our biggest hurdles will be getting engineering to change their design definition process. Also, our legal department is leery about depending on a database and systems to pull engineering information up to 50 years old. They are more confident in an archived drawing database.

DANIEL MASON, VIRTUAL PRODUCT DEVELOPMENT, CATERPILLAR, HEAVY MACHINERY OEM, UNITED STATES

It is really great to see that so many companies are sharing and using PMI information. This continues an increasing trend in recent years. Not many years ago this was a very different picture. The critical sea-change occurred when good standards emerged (like STEP 2E) to support it and as CAD systems rolled out quality implementations. As more companies benefit from more applications, more will emerge. And corporate process barriers will come down as early adopters prove the benefits of their pioneering efforts to others less confident.

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

The largest hurdles are cultural, but some technical hurdles remain. There are huge cost savings when operations buys into trusting the engineering master model and everyone collaborates off it. We are already seeing order of magnitude cost savings from pushing through this cultural shift.

PAUL NELSON, PLM SYSTEMS ENGINEER, ATK, AEROSPACE SUPPLIER. UNITED STATES

I have to give the adopters of model-based initiatives credit, at least they're starting to explore and leverage mobile platforms. That's a good thing. So many enterprise roles today are mobile in nature. Engineers are often running between conference rooms, supplier sites, prototyping and testing labs and the shop floor. This enables them to be productive without sitting at their desks.

CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

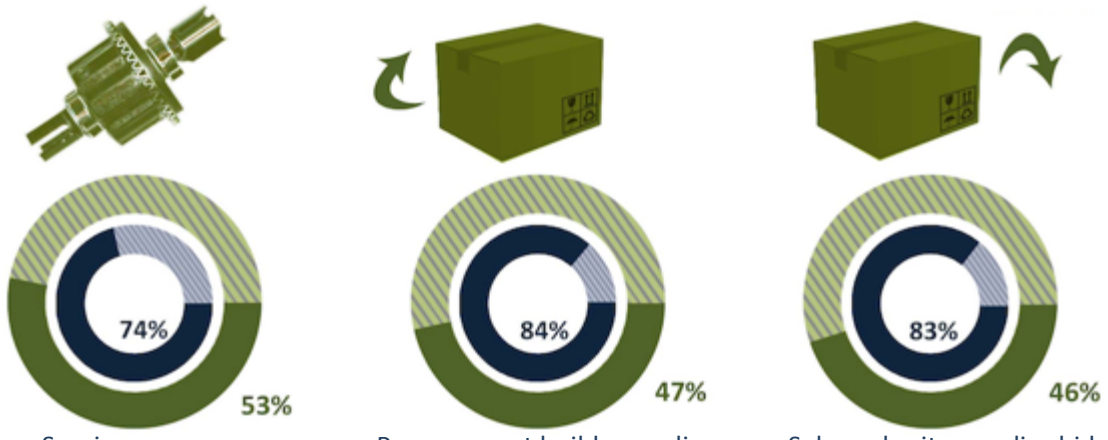
The use of 3D annotation methods, notes, dimensions and GD&T has been the basis for the implementation of Model Based Initiatives in many companies. Including material information could help companies expand the use of Model Based Initiatives into downstream activities for example automating NC programming

PAUL BROWN, MARKETING DIRECTOR, DIGITAL PRODUCT DEVELOPMENT, SIEMENS PLM

MOST PREVALENT APPLICATIONS

OF 3D MODELS OFF THE CRITICAL PATH

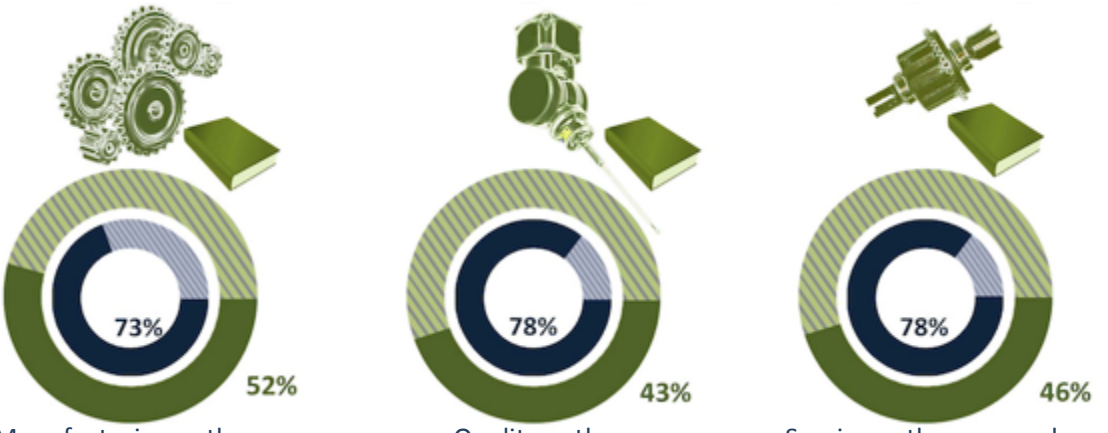
3D Models 2D Drawings



Services assess maintenance feasibility

Procurement builds supplier bid packages using

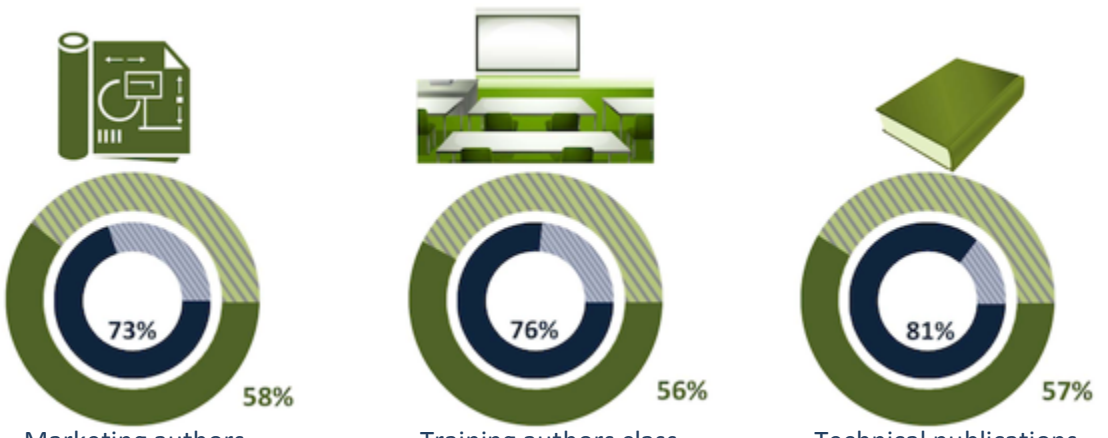
Sales submits supplier bid packages using



Manufacturing authors instructions using

Quality authors documentation using

Service authors procedure instructions using



Marketing authors product specs using

Training authors class materials using

Technical publications authors deliverables using

The key to achieving a true 3D only paradigm is to re-engineer the complete lifecycle so that all users that interact with the data can maintain the digital thread. The culture changes associated to getting away from having the drawing as a "security blanket" are slow to evolve, especially in the Aerospace industry.

JIM JOHNSON, PLM APPLICATIONS ENG., LOCKHEED MARTIN AERONAUTICS, AEROSPACE OEM, UNITED STATES

At Siemens PLM we believe that it is key that design data can be shared outside of the engineering department. Using the ISO standard JT format as a common backbone to feed tools like technical publications and service documents means the 3D model can be easily reused outside of the CAD environment.

PAUL BROWN, MARKETING DIRECTOR, DIGITAL PRODUCT DEVELOPMENT, SIEMENS PLM

Dependence on 3D is definitely growing in non-traditional applications. Not many years ago these numbers were more like 95% 2D and 10% 3D in these same applications. It is exciting to imagine a time when many more companies have increased their product quality efficiency with these new applications of 3D. Success will breed success and the pioneers who implemented earlier win more of the business.

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

Off the critical path between engineering and manufacturing, many still rely heavily on 2D drawings. But in reality, there's a large overlap between the use of 2D drawings and 3D models. Many are using both for their purposes. The reality is that the choice is not between the two, but to leverage both.

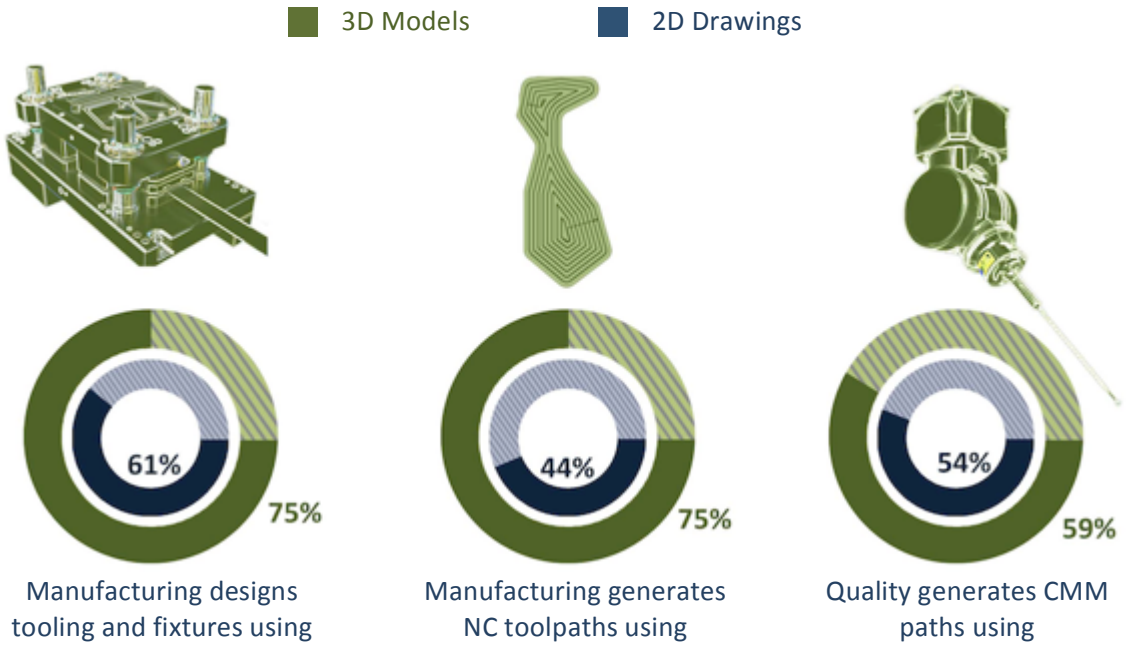
CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

Non-engineering organizations clearly still fear the use of anything 3D related, whether it is easy to use or not. They have not been instructed, trained, nor encouraged to use and understand the 3D data.

JENNIFER HERRON, MSCE AND BSME, ACTION ENGINEERING, ENGINEERING SERVICES, UNITED STATES

MOST PREVALENT APPLICATIONS

OF 3D MODELS ON THE CRITICAL PATH



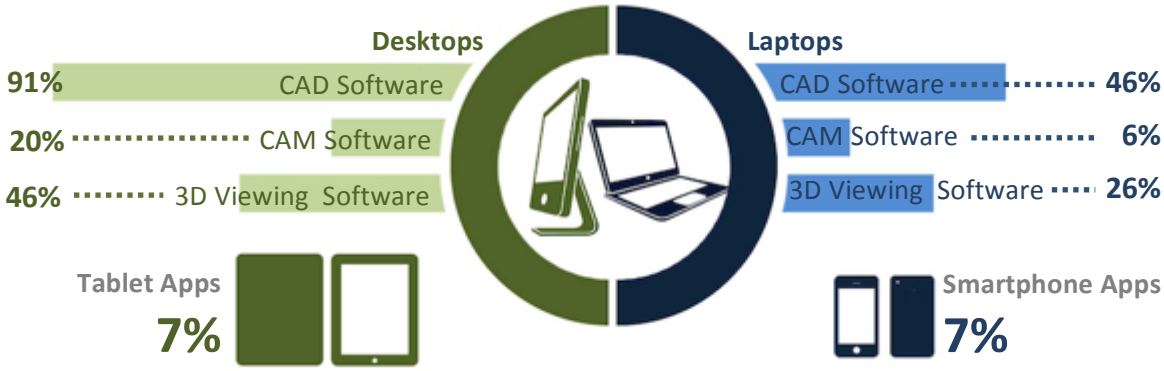
Manufacturing designs tooling and fixtures using

Manufacturing generates NC toolpaths using

Quality generates CMM paths using

ENABLING SOFTWARE

OF USING 3D MODELS ACROSS THE COMPANY



Major progress has been made through implementation of updated CAD and PLM software systems along with corresponding improvements in workstation capacity. The systems are now capable of producing full vehicle CAD models and the engineers have improved modeling practices to facilitate that system level design capability. Other non-engineering uses of 3D data are slow to evolve, but the building blocks are now in place to make it possible for other groups to capitalize on the 3D assets.

RICK MIHELCIC, MANAGER VEHICLE PERFORMANCE, PETERBILT, TRANSPORTATION OEM, UNITED STATES

While the connection between CAD and CAM is the most common use of integrated data, we are seeing an increasing demand amongst engineering organizations to close the loop with Quality Control, driving CMM machines and on machine probing from integrated PMI.

PAUL BROWN, MARKETING DIRECTOR, DIGITAL PRODUCT DEVELOPMENT, SIEMENS PLM

The use of 3D in the enterprise is certainly more feasible that it has been in the past. Unfortunately, I do not believe most businesses have realized or truly leveraged the use of 3D product data. To most, it is used primarily to show somebody an image.

KELLEY KIMBALL, MECHANICAL ENG. MGR., CENCO INTERNATIONAL, AEROSPACE SUPPLIER, UNITED STATES

The connection between design and manufacturing has been one of the earliest and strongest initiatives in CAD/CAM. Early home-runs spawned valued cost-benefit analyses, which spawned more development and deployment initiatives, which produced more heroes. We should learn from this model as we push for higher 3D ubiquity in other strategic areas within PLM.

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

Back on the critical path between engineering and manufacturing, 3D models are the primary deliverable that is used to get work done. But again, I think these findings imply that, in reality, both 2D drawings and 3D models are used together.

CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

RESEARCH METHODOLOGY

HOW THE STUDY WAS DESIGNED AND CONDUCTED

THE LIFECYCLE THE STUDY'S SURVEY

In March and April 2013, Lifecycle Insights and Longview Associated surveyed 844 respondents to understand their practices and adoption of technology on the issues of design data interoperability, model-based initiatives and the use of 3D across the enterprise.

Chad Jackson of Lifecycle Insights and David Prawel of Longview Advisors developed this study's survey between February 18th 2013 and March 11th 2013 with reviews and feedback from research partners, software providers and industry practitioners.

The survey for this study collected responses between March 11th 2013 and April 26th 2013 on survey monkey. Survey respondents originated from five research partners, including Lifecycle Insights, Longview Advisors, Cadalyst, ENGINEERING.com and PDES Inc., as well as five software providers, including CT Core Technologie, Lattice Technology, PTC, Siemens PLM and Tetra4D. No research partner or software provider contributed more than 20% of the total respondents. Survey respondents were compensated for their response with a complimentary copy of this report.

THE DEMOGRAPHICS OF THE STUDY'S SURVEY

The number of respondents to the survey totals 844. The findings of this report, however, are based on a subset of these respondents, totaling 372, that completed the entire survey and that directly participate in the product development supply chain. Responses from software providers, service providers and system integrators were excluded.

Respondents to the study's survey serve a wide variety of industries. The industries served at the highest rates by the survey respondents include: 32% Aerospace & Defense, 31% Industrial Equipment or Heavy Machinery, 28% Automotive, 18% Consumer Products, 17% Electronics and High Tech. However, these industries were not served exclusively. Fully 39% of the respondents designated that they serve more than single industry.

Survey responses for this study were gathered from twenty-five different countries. The contribution by geographic area is as follows: 86% North America, 6% Europe, 3% Asia, 3% from Australia and New Zealand and less than 1% from Africa, South America and the Middle East each.

Respondents to the survey hold a number of roles, including: 56% staff (workers, individual contributors), 40% managerial (manager, director) and 4% executive (vice president) or leadership (president, CEO, CFO). These respondents are employed at companies with a wide range of revenues, including: 49% from companies with less than $100 million in revenues, 24% from companies with revenues between $100 million and $1.25 billion in revenues and 27% from companies with revenues more than $1.25 billion.

RESEARCHERS AND AUTHORS

WHO CONDUCTED THE STUDY AND WROTE THE REPORT

CHAD JACKSON, INDUSTRY ANALYST, LIFECYCLE INSIGHTS

Chad Jackson is the President and Principal Analyst of Lifecycle Insights, a research and advisory firm that assesses the business impact of software applications and systems on engineering organizations. Chad has more than 15 years of experience with CAD, CAE, PDM, PLM and related technologies as part of the analyst community and software industry. Due to his industry knowledge and thought leadership, Chad is a sought-after expert, author and speaker that has advised, published and presented dozens of times domestically and internationally.

Before founding Lifecycle Insights, Chad led Aberdeen's Product Innovation and Engineering practice as Vice President and Principal Analyst. While there, Chad defined and directed the practice's vision for the research, services and programs including the 2007, 2008 and 2009 Product Innovation Summit executive events. Chad's research responsibilities ranged from core design and engineering issues to front-end innovation topics, technical communications, manufacturing planning and engineering related sourcing. During his four year period at Aberdeen, Chad produced over 100 research-based publications that benchmarked the performance, strategies and tactics of over 5,000 product development stakeholders.

DAVE PRAWEL, FOUNDER AND PRESIDENT, LONGVIEW ADVISORS

David Prawel is founder and president at Longview Advisors Inc., a consulting firm serving the manufacturing industry. He has enjoyed a 30-year career in scientific and engineering software. As a consultant, speaker, author, and entrepreneur, he provides insight and advice about 3D technology to dozens of manufacturers and software companies around the world. He has published nearly 100 articles and presented at dozens of international conferences on a wide range of topics involving 3D software, CAD, interoperability, collaboration and PLM. He has participated in 6 startup companies, with one successful IPO and another has become one of the largest wireless Internet service providers in the US.

Prawel has a BS and MS from University of Buffalo, an MS from Rutgers University, and a Ph.D. from Colorado State University in Biomedical Engineering, in the Department of Mechanical Engineering. He currently runs Longview Advisors and holds a part-time position as Senior Research Scientist and Associate Director of the Biomaterials Research and Engineering Laboratory, School of Biomedical Engineering, Department of Mechanical Engineering at CSU.

SPONSOR BEHIND THIS REPORT

THANKS TO THOSE THAT SUPPORTED THIS STUDY

ABOUT THE SPONSOR

Siemens PLM Software, a business unit of the Siemens Industry Automation Division, is a leading global provider of product lifecycle management (PLM) software and services with seven million licensed seats and more than 71,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software works collaboratively with companies to deliver open solutions to help them make smarter decisions that result in better products. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm.

ABOUT NX

NX is an integrated product design, engineering and manufacturing solution that helps companies deliver better products faster and more efficiently. NX integrates three key capabilities for fast, efficient and flexible product development:

- Advanced solutions for conceptual design, 3D modeling and documentation
- Multi-discipline simulation for structural, motion, thermal, flow and multi-physics applications
- Complete part manufacturing solutions for tooling, machining and quality inspection.

NX solutions help companies design, simulate and manufacture better products faster by enabling smarter decisions in an integrated product development environment. NX helps customers:

- Increase the number of new products introduced
- Reduce development time by more than 30%
- Shorten design-analysis iterations by more than 70%
- Reduce NC programming, machining and tool design time by more than 30%

ABOUT PAUL BROWN

Paul Brown is Senior Marketing Director, NX Product Engineering Software for Siemens PLM Software.

He has broad experience in digital product development. He began his career as a mechanical designer with a machinery manufacturing company and has over 25 years of experience implementing Computer Aided Design (CAD) systems. Since joining Siemens PLM Software in 1985 he has held a variety of customer-focused leadership roles within the company in both its UK and Europe, Middle East and Africa (EMEA) organizations, including pre-sales support and country and zone marketing.

In his current role Paul is responsible for the global Marketing team in the NX Product Engineering Software group. His team is tasked communicating product related information for both current and future developments between the Siemens PLM Software global customer base and its product development engineers. He is located in the company's Camberley, UK office.