Productivity and Return on Investment from SolidWorks® CAD Software

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Executive Summary

This report summarizes the results of a third-party survey of the productivity gains experienced by more than 1,000 users of SolidWorks computer-aided design (CAD) software. This data is useful to companies considering a purchase of new CAD software. The findings of the study show that using SolidWorks CAD software for product development produces the following results:

- 95% of the companies responding reported an increase in productivity;
- 69% of the respondents reported faster product time-to-market;
- 95% of the respondents reported one or more productivity gains;
- The average time-to-increased-productivity was about two months;
- The results are consistent across different industries and previous CAD systems used.

When evaluating CAD systems, manufacturers often view increased productivity as the most important point of comparison. To obtain the most objective understanding of potential productivity gains, manufacturers should calculate their expected Return on Investment (ROI) and consider as many quantifiable benefits as possible.

To calculate expected ROI, manufacturers should use Total Cost of Ownership (TCO) to compare costs, including those for hardware, maintenance, upgrades, support, and training. This report provides details on how companies can calculate TCO, determine expected ROI, and evaluate CAD vendors before making a decision to purchase a new CAD system.

Survey Purpose and Method

The purpose of this survey was to have a third party measure the ROI and the productivity impact experienced by companies from many industries who migrated to SolidWorks CAD software from a previous CAD system. An invitation to participate in a web-based survey was distributed to thousands of SolidWorks customers. The survey produced over 1,000 responses that were suitable for analysis.

Discussion of Key Findings

Overall, 95% of the companies reported an increase in productivity from using SolidWorks CAD software. Survey respondents cited multiple areas where they had experienced productivity increases, such as a reduction in the number of Engineering Change Orders (ECOs), a reduction in the time required to complete an ECO, and an acceleration in product time-to-market.

An in-depth review of the data reveals several key findings.

Faster Time-to-Market is Most Frequent Benefit

Faster time-to-market was the most frequently cited productivity benefit of using SolidWorks CAD software, with 69% of the respondents reporting an improvement in product time-to-market. Faster time-to-market can be an important advantage for nearly every manufacturing business. Beating a competitor to market usually enables a manufacturer to both capture more market share and realize higher sales and profit margins.

Many of the specific productivity benefits cited by respondents also contribute to accelerating the product development process. For example, reducing the time spent on a given change to a product design or reducing the number of design errors both help manufacturers bring products to market faster.

ROI Comes from Many Sources

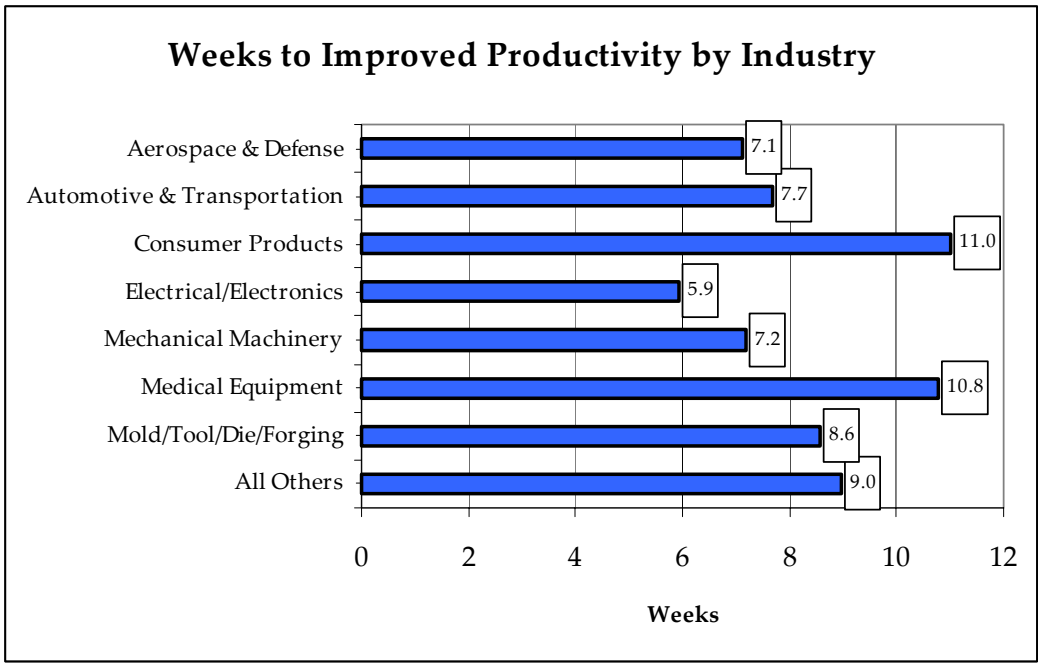
The ROI a company experiences as a result of using SolidWorks CAD software is related to several specific productivity benefits.

Productivity Benefit	Percent of Respondents Reporting
Faster Time to Market	69.0%
Reduced Volume of ECOs	46.1%
Reduced Time Spent on Average ECO	68.2%
Reducing Scrap from Design Errors	62.9%
Reducing Scrap through CAM Integration	46.1%
Reported at Least One of the Above Benefits	**90.2%**
Reported Any Productivity Increase	**94.7%**

More than 90% of the companies in the survey reported one of the specific productivity increases listed above. Of the remaining 10% of companies that did not report one of these productivity increases, 46% reported some other increase in productivity in the comments section.

Productivity Gains Materialize Quickly

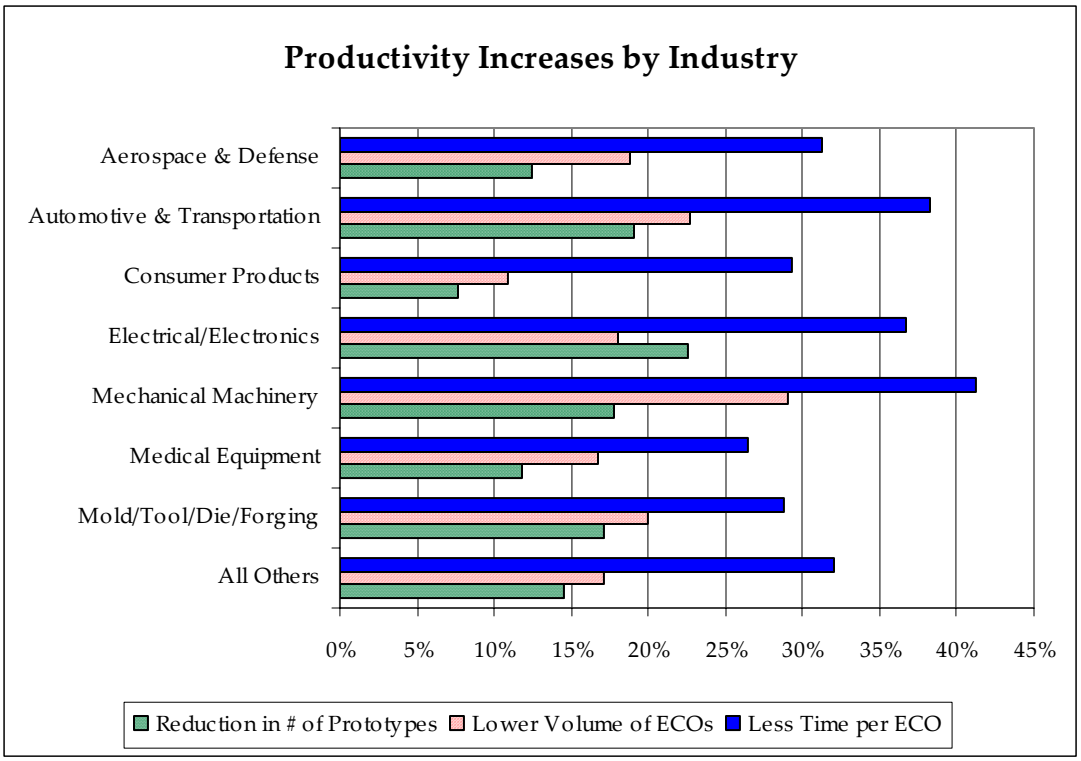
Learning and becoming fluent in a new CAD system quickly is an important component when calculating ROI. Having your engineers and designers become productive in a new CAD system in a short period of time compensates for any down time related to the transition. Survey respondents indicated that it took about two months (8.4 weeks) on average to become more productive with SolidWorks than their previous CAD system. The data varies slightly from industry to industry.



These responses show that SolidWorks enables manufacturers in a variety of industries to become more productive in a relatively short amount of time.

Productivity Increases are Consistent Across Many Industries

Across all the industries surveyed, the results are generally consistent, showing that different types of companies have realized productivity gains by using SolidWorks software. For example, the decrease in the number of ECOs and the time spent processing each ECO were reduced by an average of 20% and 34%, respectively, across all industries. Detail is provided in Appendix B.



Productivity Benefits are Consistent Across Many Previous CAD Systems

In analyzing the productivity benefits of using SolidWorks software based on the previous CAD system used, respondents reported an increase in productivity no matter which CAD system they used previously.

One interesting data point is that the reduction in the volume of ECOs related to SolidWorks was not as great when compared to another parametric solid modeler. Pro/ENGINEER® users experienced a 5% reduction in the volume of ECOs, lower than the average for all other respondents. Manufacturers that transitioned from Pro/ENGINEER to SolidWorks experienced greater productivity gains in other areas, such as reducing the time to process an ECO by 26% and improving their time-to-market by 22% (See Appendix B).

Survey Comments Support Data on Productivity

The comments provided by respondents provide additional support for the conclusions drawn from the data.

"[SolidWorks is] extremely intuitive in regards to all aspects of the rapid design process, allowing us to make quick prototypes, presentations, and design/engineering/marketing decisions."

- Fortune 500 Consumer Products Company (previously used AutoCAD®)

"Faster and more accurate gauge and fixture design. We know the weights of our products before we make them. There are several projects that we could not have done without SolidWorks."

- Aerospace and Defense Company (previously used CADKEY®)

"Most of our vendors use SolidWorks. The prototype parts are usually correct the first time. We have greatly shortened the time it takes to get a product from a dream to reality."

- Consumer Products Company (previously used AutoCAD LT®)

"Making changes [is the most significant benefit]. It takes the same amount of time to draw the original, but 75% less time to make changes. Changes are two-thirds of the job. Most of the savings due to SolidWorks stem from design time, and drafting time, and ease of learning the package."

- Fortune 500 Electrical/Electronics Company (previously used SolidDesigner)

"Better products (easier to assemble, lower cost, higher performance) designed more quickly with less design labor."

- Mechanical Machinery Company (previously used Pro/ENGINEER)

"Because SolidWorks allows the designer to look at more design options, the time to production stays the same. However, the quality, features and functionality are dramatically improved. Only one prototype build is required for verification testing. Along with PhotoWorks®, marketing can evaluate concepts with customers during the development phase of a project before spending money and time on hardware."

- Medical Equipment Company (previously used AutoCAD)

"The design of sheet metal cabinets for our battery chargers went from approx one year to two weeks in time."

- Electrical/Electronics Company (previously used Pro/ENGINEER)

Sample ROI Calculations

While any business needs to perform its own ROI calculation based on its unique processes and needs (suggestions on how to do this are contained in Appendix C), the data gathered through this survey can be a useful guide in determining if new CAD software makes sense. Two sample ROI calculations for different hypothetical businesses follow. Detail is included in Appendixes D and E.

Small Mold/Tool/Die/Forging Shop

This business has three designers who use AutoCAD. Their average salary is $50,000 per year plus 30% for benefits and overhead. The engineering and design group processes about 75 ECOs per year. Each ECO takes about seven hours to process. The company typically launches two new products each year, each of which generates about $350,000 in annual revenue with a 30% gross profit margin. The product design cycle averages three months. We will also assume that they will also purchase new hardware. Finally, we will assume that they are in a growing industry with a moderate cost of capital and apply a 10% discount rate.

Using the data from the survey as a guide, we can expect that this company will realize the following productivity gains as a result of migrating to SolidWorks:

- 25% improved time-to-market
- 22% reduction in volume of ECOs
- 32% decrease in engineering time per ECO

If we assume that the first year cost of license, hardware, training (including lost productivity), support, installation, and management is $8,000 per seat, and that maintenance, upgrades, and any additional costs are $2,000 a year after that, then SolidWorks more than pays for itself in the first year, providing a one-year ROI of over $40,000 and a three-year ROI of over $150,000.

Large Mechanical Machinery Company

This business has 20 designers that are currently using Pro/ENGINEER. The average salary is $60,000 per year plus 35% in benefits and overhead. The engineering and design group processes about 400 ECOs each year. Each ECO takes about five hours to process. The company typically launches three new products each year, which bring in about $5 million in annual revenue with a 15% gross profit margin. The product design cycle averages four months. We will assume that they will not have to make any hardware upgrades or other adjustments. Finally, we will assume they are in an extremely high-growth industry with a high the cost of capital and apply a 25% discount rate.

Using the data from the survey as a guide, we can expect that this company will realize the following productivity gains as a result of migrating to SolidWorks:

- 20% improved time-to-market
- 5% reduction in volume of ECOs
- 25% decrease in engineering time per ECO

If we assume that the first year cost of license, hardware, training (including lost productivity), support, installation, and management is $10,000 per seat, and that maintenance, upgrades, and any additional costs are $2,500 a year after that, then SolidWorks provides a one-year ROI of over $330,000 and a three-year ROI of over $1,000,000.

Appendix A: Disclosure

I am a graduate degree candidate in the 2003 MBA class at the MIT Sloan School of Management with experience in the software industry, both as an investment banker and as a strategic consultant for software and other companies in the high-tech industry. This survey was conducted impartially and the conclusions drawn are based on sound statistical and business analysis. I want to disclose that I received financial consideration for my work in conducting the survey and preparing the report. I encourage all companies to do thorough research into all appropriate CAD systems before purchasing and not to rely exclusively on this or any other single piece of information.

Appendix B: Table of Summary Results

	# of Weeks Until More Productive	% Decrease in Number of ECOs	% Decrease in Time to Complete Each ECO	% Decrease in Number of Prototypes Needed	% Scrap Savings by Reducing Design Errors	% Scrap Savings from CAM Integration	% Faster Time to Market
All respondents	**8.4**	**20%**	**34%**	**16%**	**21%**	**21%**	**23%**
By Industry							
Aerospace & Defense	7.1	19%	31%	13%	28%	17%	28%
Automotive & Transportation	7.7	23%	38%	19%	20%	31%	40%
Consumer Products	11.0	11%	29%	8%	16%	25%	12%
Electrical/Electronics	5.9	18%	37%	23%	23%	25%	28%
Mechanical Machinery	7.2	29%	41%	18%	27%	28%	25%
Medical Equipment	10.8	17%	26%	12%	13%	13%	11%
Mold/Tool/Die/Forging	8.6	20%	29%	17%	13%	23%	24%
All Others	9.0	17%	32%	14%	19%	20%	23%
By Previous CAD System							
AutoCAD	8.1	24%	36%	19%	21%	26%	25%
CADKEY	10.4	20%	34%	12%	17%	19%	26%
Mechanical Desktop	5.9	21%	28%	11%	19%	26%	22%
Pro/ENGINEER	8.5	5%	26%	13%	16%	15%	22%
All Others	8.8	21%	37%	14%	25%	25%	21%

Appendix C: CAD Evaluation Recommendation

When doing an evaluation of a CAD system, I recommend that companies evaluate the total cost of ownership (TCO) and return on investment (ROI) from each CAD system for comparison. The upfront license cost is often only a small portion of the total cost, so it is important to use the TCO methodology to measure costs. Calculating the ROI enables manufacturers to compare the real value of different systems. The choice of a CAD system should be based on ROI. For example, a system with a 20% higher TCO but a 50% higher ROI is still the right choice even though the upfront cost is higher.

Total Cost of Ownership (TCO) Methodology

- What is the total expected cost? Include all aspects of cost over the expected life of the software, or at least a minimum of the next 3-5 years.
    - Training (both cost of training and lost productivity while engineers are in class)
    - Internal maintenance (your additional MIS costs)
    - Additional hardware (if software necessitates the purchase of new hardware)
    - Future upgrades
    - Service and support

Return on Investment (ROI) Methodology

- Quantify all of the expected benefits from the software. What is the specific dollar value that this software can provide by…
    - Getting to market faster?
    - Increasing engineering productivity through?
        - Cutting the volume of ECOs?
        - Lowering the time spent processing each ECO?
        - Reducing the number of design errors?
    - Decreasing manufacturing scrap?
    - Lower training, retraining, or hiring costs?
    - Better communication with partners?
    - Using less expensive hardware?

Within the categories of TCO and ROI, there are numerous detailed lines of questioning that you should pursue when evaluating a CAD software product. Following are topics you might want to evaluate when comparing CAD systems.

Handling of Large/Complex Assemblies

- What size of assemblies do you expect to work on?
- Can the CAD system you are evaluating handle assemblies of that size?
- Have you seen it in action?

Ease of Use

- How long will it take to make changes to your parts? Will you save any time processing your typical ECO?
- How long will it take for you to become a productive user of the new software?

Related Applications

- What related applications are important to you, both now and in the future? (e.g., product data management (PDM), finite element analysis (FEA), etc.).
- Are these related applications available for this CAD system?
- Are the ones that are available best of breed, or at least good enough for your needs?
- How integrated are they?
- How much additional training will they require?

Market Acceptance

- How many other companies are using this product?
- What is the track record of other companies achieving productivity gains?
- Will your file types work with your external partners?
- Will you be stuck using an unpopular file format?

Compatibility with Legacy Data

- How easy is it to import old parts and assemblies?
- How long will one of your parts typically take to import?
- Do you need to convert all of your legacy data?
- In order to be productive, what portion of legacy data would need to be converted and how long would this take?

After-Sales Support

- How does the company provide technical and user support?
- What will this cost and when is it available?
- What do other customers have to say about their experience?

Vendor Viability

- How long has this vendor been around?
- Do they have a track record?
- Are they profitable?
- What is their cash position?
- Are their sales growing? (both in dollars and number of seats)
- Will they be around for the next 5-10 years? Where can you get support if they go bankrupt?

Appendix D: Sample ROI for Small Mold/Tool/Die/Forging Shop

Cost Savings from Faster Time-to-Market

Size of engineering and design team	3
Average fully-loaded salary (includes variable overhead)	$65,000
Time-to-market improvement using SolidWorks	**25%**
Annual time savings from increased productivity (in man-hours)	1500
Annual cost savings from improved time-to-market	**$48,750**

Increased Profit from Faster Time-to-Market

Number of new products per year	2
Average annual revenue per product	$350,000
Average profit margin for a new product	30%
Current product development process time (months)	3
Time-to-market improvement using SolidWorks	**25%**
Time-to-market improvement (months)	0.75
Annual financial value of improved time-to-market	**$13,125**

Cost Savings on Routine Changes to Existing Designs

Current number of ECOs per year	75
Current average time to complete one ECO (hours)	7
Total time currently spent on ECOs (man-hours)	525
Reduction in number of ECOs from SolidWorks	**22%**
Reduction in time per ECO from SolidWorks	**32%**
Annual reduction in time spent on ECOs (man-hours)	278.46
Annual cost savings of increased productivity	**$9,050**

Summary of Savings and Increased Profit

Cost savings from improved time-to-market	$48,750
Additional profit from improved time-to-market	$13,125
Cost savings of other increased productivity	$9,050
Discount rate	10%
Annual financial benefit from SolidWorks	**$70,925**
Three year financial benefit from SolidWorks, net present value	**$194,018**

Total Cost of Ownership (TCO)

Assumed first year total cost (including license, hardware, training, support, installation, management, etc.) per seat	($8,000)
Assumed annual cost after first year (including upgrades, support, additional training, etc.) per seat	($2,000)
Number of seats purchased	3
TCO for first year for all seats	**($24,000)**
TCO over three year period for all seats, net present value	**($35,395)**

Return on Investment (ROI)

Total ROI for first year	**$46,925**
ROI for first three years, net present value	**$158,623**

Appendix E: Sample ROI for Large Mechanical Machinery Company

Cost Savings from Faster Time-to-Market

Size of engineering and design team	20
Average fully-loaded salary (includes variable overhead)	$81,000
Time-to-market improvement using SolidWorks	**20%**
Annual time savings from increased productivity (in man-hours)	8000
Annual cost savings from improved time-to-market	**$324,000**

Increased Profit from Faster Time-to-Market

Number of new products per year	3
Average annual revenue per product	$5,000,000
Average profit margin for a new product	15%
Current product development process time (months)	4
Time-to-market improvement using SolidWorks	**20%**
Time-to-market improvement (months)	0.8
Annual financial value of improved time-to-market	**$150,000**

Cost Savings on Routine Changes to Existing Designs

Current number of ECOs per year	400
Current average time to complete one ECO (hours)	5
Total time currently spent on ECOs (man-hours)	2000
Reduction in number of ECOs from SolidWorks	**5%**
Reduction in time per ECO from SolidWorks	**25%**
Annual reduction in time spent on ECOs (man-hours)	1425
Annual cost savings of increased productivity	**$57,713**

Summary of Savings and Increased Profit

Cost savings from improved time-to-market	$324,000
Additional profit from improved time-to-market	$150,000
Cost savings of other increased productivity	$57,713
Discount rate	25%
Annual financial benefit from SolidWorks	**$531,713**
Three year financial benefit from SolidWorks, net present value	**$1,297,379**

Total Cost of Ownership (TCO)

Assumed first year total cost (including license, hardware, training, support, installation, management, etc.) per seat	($10,000)
Assumed annual cost after first year (including upgrades, support, additional training, etc.) per seat	($2,500)
Number of seats purchased	20
TCO for first year for all seats	**($200,000)**
TCO over three year period for all seats, net present value	**($287,059)**

Return on Investment (ROI)

Total ROI for first year	**$331,713**
ROI for first three years, net present value	**$1,010,320**