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Estimated Supplier Cost-Savings Due to Expanded Use of a Lightweight Data-Transfer Format

A Cyon Research Report
November 11, 2006

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Executive Summary

The typical relationship between original equipment manufacturers (OEMs) and their tier-1 suppliers within the automotive industry requires that the supplier design components and sub-systems using the same computer-aided design (CAD) software that the OEM is using for a given vehicle program. In some cases, the supplier is able to do design work in a different system and then translate data into the preferred system's format prior to data delivery to the OEM.

The requirement to be totally compatible with their OEM customers means that suppliers incur higher costs than if they were able to use fewer different design systems. Not only do the suppliers need to maintain multiple CAD systems, but they often have to support multiple releases of each. One large supplier currently maintains 40 different implementations of CAD software in order to be compatible with its different customers.

Within the automotive industry, UGS' JT has been widely adopted as a lightweight data-exchange format, particularly for applications such as visualization and vehicle mockup.[1]

JT Open is an organization of users and software vendors involved in either using JT-related software or in providing such tools. The Automotive Support Group (ASG) is an organization of senior executives from a number of major OEMs that are users of UGS product-lifecycle management (PLM) products. Since mid-2005, the two groups have been discussing expanding the use of JT so that suppliers would be relieved of the burden of providing design data in the wide variety of CAD-specific formats that the various OEMs require. Their expectation is that the savings for both suppliers and OEMs would be substantial if the solution were implemented.

Cyon Research was retained by JT Open to quantify these savings. Because of the sensitive nature of the data, we have disassociated the data from any company—the data here reflects vetted industry information, but does not reflect the specifics of any one company.

Potential cost savings were divided into two categories—hard savings and soft savings. Hard savings are from areas where a specific budget line item may be reduced or a resource may be reallocated—for instance, those in which it is possible to identify a specific number of people who could be reassigned because their present assignments would no longer be needed, or where specific hardware and software costs could be

[1] Cyon Research White Paper: "The Business Case for a Common Data Distribution Platform – A Look at UGS' JT," January 16, 2006

eliminated. Soft savings are any savings that are not directly attributable to a budget line item, such as improvement in product quality, the protection of intellectual property, or more efficient use of designer resources.

Experience has shown that soft savings through the implementation of new technology often outweigh hard savings, and that soft savings are frequently underestimated.

Worldwide automotive industry supplier volume in 2006 has been estimated by others at $504 billion. Cyon Research estimates that, were a single platform such as JT to be implemented as a standard data-transfer mechanism, the automotive-industry suppliers would benefit from savings in the range of $500 to $800 million annually. Cyon Research expects that the savings will grow proportionally as supplier revenue grows.

Not all of these savings would be realized immediately. Many of these changes would need to be phased in over a period perhaps as long as five years. Cyon Research believes that the economic benefits for the OEMs would also be substantial, as described below.

Description of the Problem

The automotive industry was one of the first large users of CAD technology. Internal development started even before CAD systems were first commercialized. General Motors Research started work on its DAC-1 system in the late 1950s. Over the years, the OEMs used a combination of internally developed software, such as Ford's PDGS, and a variety of commercial systems.

Suppliers were slower to adopt CAD technology, partially because they predominately manufactured parts based on designs provided to them by the OEMs in the form of hard-copy drawings. In recent years, suppliers have taken on an increasing amount of detailed design.

Starting in the early 1990s, the OEMs dramatically reduced the effort they expended on developing custom software and switched increasingly to commercial systems. A new trend emerged, whereby the OEMs went through extensive evaluation processes to select a single system they could standardize around— although in some cases, they selected different systems for power-train and body design. They did not stop using specialty software; point solutions for body styling, structural analysis, and facility planning continued to be part of the mix.

Increasingly, the OEMs required that their tier-1 suppliers work with the same CAD systems they were using. In some cases, they required the vendors of these software packages to provide the software to their suppliers at the same discounted price they were paying. This enabled them to provide vehicle-definition data to the suppliers in a format they knew could be accurately read, and to receive detailed design data back in the same format.

While the automotive industry had long been a major sponsor of industry standards such as IGES and STEP for data transfer, it was well recognized that these techniques were not as reliable as transferring data in native CAD formats.

Since the major OEMs frequently used different CAD systems, tier-1 suppliers who worked with more than one OEM were typically faced with the task of installing and supporting multiple CAD systems. The typical organizational approach involved having different engineering and design teams assigned to a specific manufacturer, with each team using a different CAD system. While this has been a workable solution, it significantly reduces a supplier organization's flexibility in meeting its changing business requirements.

In some cases, the suppliers work with their preferred CAD system internally and then translate the data into the format required by the customer for delivery. Where this solution is viable, it does help alleviate some of the supplier's costs; it also adds back the cost related to translation and translation issues.

One unexpected consequence of the current process is that as the software vendors introduce new releases of their software, it is necessary to ensure that everyone is working with the same version. Since design is a continuing process, this cannot be done on an "as convenient" basis; everyone must to switch at the same time. Fairly complex procedures have been implemented over the years to coordinate the installation of a new software release.

The need to keep everyone synchronized typically has resulted in the use of software releases as much as two years out of date, primarily because of the testing and validation required. This has led to significant frustration among the suppliers Cyon Research interviewed. They are concerned that they are not able to use the latest available design tools and, in many cases, are unable to use other new software packages because the version of CAD software they are required to use is not compatible.

A second problem has been that once a particular vehicle program was started with a particular release of software, work often had to continue using that release. Even smaller suppliers end up supporting as many as 20 different software releases of three or four CAD systems, while we spoke with one large supplier who supports over 100.

In preparing this report, Cyon Research spoke with suppliers who are still required to supporting Ford's internally developed PDGS software even though it has been more that a decade since PDGS was replaced by an off-the-shelf system—SDRC's I-DEAS software. With Ford currently switching to CATIA V5 for body design, some suppliers are likely to find themselves supporting I-DEAS in body design years after they have implemented V5 in order to be compliant with Ford's new requirements.

The following list details some of the costs incurred by the suppliers.

- **Infrastructure –** On occasion, an older release of a CAD software package will require an older version of the operating system. This typically will require maintaining a separate computer system to support that release. Many suppliers are currently required to maintain both UNIX and PC systems, when they would prefer to standardize on a single Windows-based platform, as these are much less costly to procure and maintain.

- **Design Outsourcing –** If everyone is required to use OEM-designated software, it restricts a supplier's ability to outsource work—only those firms that have that specific CAD system will qualify. Eliminating this constraint would open the door to greater competition for the work and a corresponding decrease in cost and increase in quality are a likely result from having a larger pool to choose from.

- **Communication –** The design of a new platform or the upgrade of an existing vehicle is an iterative process, requiring frequent exchanges of design data. If a transfer is delayed due to the need to translate data into an approved format, or for any other reason, it can result in some team members being unable to proceed with their work. If an OEM is able to release a new vehicle on or ahead of schedule, potential savings are substantial. Time-to-market has become a dominating factor in this industry—as in others—and the ability to effortlessly exchange data with the click of a mouse button helps keep projects on schedule.

- **Designer efficiency –** There are many dimensions to this issue. On one hand, it involves the flexibility of assigning the right person to a project, not just someone who happens to have been trained on a particular CAD package. On the other hand, efficiency can involve saving time designers spend, for example doing "cut sections," a task that can be handled directly by engineers using appropriate viewing software.

- **Software release process –** The block upgrade process insisted on by some OEMs requires substantial supplier activity prior to the typical weekend upgrade, and often overtime during the upgrade itself. If the upgrade goes badly, the possibility exists that designers will be unable to work until the problems are fixed.

- **Internal translation costs –** As mentioned above, one solution is to translate data from one CAD systems to the one required by the OEM. This involves the cost of extra software as well as the labor to do the translations and verify the accuracy of the results. Some suppliers outsource these conversions to firms that specialize in that type of work, incurring substantial additional direct costs.

- **Extra training –** Obviously, if a supplier is using multiple systems, individuals need to be trained on several packages. The cost burden for this includes both the direct cost of the training as well as the cost for the time of the person trained, whether it is done internally or by outside contractors.

- **Intellectual property protection –** While OEMs require sufficient data from a supplier to incorporate designs into a vehicle mockup and for other visualization and analysis tasks, the suppliers are reluctant to provide the type of design details contemporary CAD systems contain. Suppliers often spend considerable effort stripping proprietary data out of their designs before the information is transferred to an OEM. This has to be done each time there is a data transfer.

- **Supplier competitiveness –** If the need for expertise in a specific CAD system (and specific release) and the availability of that software can be avoided, a supplier can compete for new business on a more even playing field.

- **Quality and frequency of data exchange –** Having a way to exchange CAD data that would not require both parties to have the same CAD system would facilitate more frequent exchange of information between the supplier and the OEM. This, in turn, would reduce the chances that someone is working with obsolete data—and therefore, would reduce unnecessary rework.

Analysis Methodology

In July 2005, ASG and JT Open held a joint workshop to explore potential savings if JT were adopted as the standard data-transfer format throughout the automotive industry. Quantifying the potential savings proved difficult for the suppliers. On top of that, many suppliers were reluctant to share such data with their competitors.

Despite these constraints, Cyon Research has been able to set an initial estimated range for each of many areas of potential savings from the adoption of an effective single platform by the automotive industry. This range is shown in the table below.

The areas of potential cost savings were discussed in face-to-face interviews with several tier-1 suppliers, who also provided initial cost savings estimates. These observations were discussed in a series of follow-up telephone interviews with other tier-1 suppliers. From those interviews we were able to refine our initial estimates. The refined figures were vetted with the both groups, who agreed the projected cost savings were realistic.

In order to protect the confidentiality of the companies that did provide data, estimated savings were converted to savings per million dollars of revenue. Soft savings were treated separately from hard savings.

Many of the most stringent requirements for tier-1 suppliers to maintain software compatibility with OEMs apply to North American manufacturers. They have the desire and economic leverage to insist that their procedures be followed. “Transplant” manufacturers have a lower requirement for direct CAD-system compatibility. Foreign manufacturers, particularly in developing countries in Asia and Eastern Europe, tend to allow suppliers to use whichever system they feel is most applicable to the design task at hand.

The data Cyon Research was provided came from U.S.-based suppliers whose customers were predominately the three major U.S. OEMs. Using their data, Cyon Research extrapolated the total potential annual supplier savings by taking the sum of the savings per million dollars of revenue and applying that to the global estimated supplier revenue for 2006 and 2011.

Cyon Research chose 2006 as an example of what current savings would be if the universal use of a single data-transfer platform had been accepted in the past and were now in effect. The 2011 data represent the potential savings if these changes were made starting this year, since some elements of these savings will take up to five years to accomplish.

Industry-wide supplier revenue was derived from Mercer/Fraunhofer estimates for 2002 and 2015. These data also show total vehicle production increasing from 57 million to 76 million units during that period, and the portion of content provided by suppliers increasing from 65 percent to 77 percent. During this period, supplier revenue will increase from $417 billion in 2002 to $700 billion in 2015, while OEM-produced content will decrease from $228 billion to $203 billion.

Cyon Research based its estimates on the assumption that North American suppliers represent 50 percent of worldwide supplier volume. In addition, as a conservative guess, we assumed the potential savings foreign suppliers should realize will be at least half those of the North American participants in this study. Therefore, the preliminary savings numbers were reduced by 25 percent to take this foreign factor into consideration.

Results

Table 1 below contains Cyon Research's summary of supplier responses for potential savings, in terms of dollars saved per million dollars of revenue.

The data indicates that the typical North American supplier would save between $500 and $1,700 per million dollars of revenue—or, in other terms, a supplier with $1 billion in annual revenue could save perhaps $1.7 million annually if the automotive industry were to adopt a single platform as its sole data-transfer standard.

On a worldwide industry basis, assuming half the business falls at the high end of the savings range and half at the low end, annual savings would be in the neighborhood of $450 million to $650 million. This estimate presupposes that the shift to a single data–transfer platform had occurred some years ago.

Since some of these savings may take up to five years to achieve, it is more realistic to look at the savings in 2011. With the growth of supplier revenue to $613 billion, the worldwide annual savings that year could be in the range of $500 million to $850 million. The extent to which these savings lead to increased profits—versus reduced prices—will be determined by negotiations between the suppliers and their customers. None of these numbers have been adjusted for inflation.

	Soft Savings per $1M in Revenue	Hard Savings per $1M in Revenue
Infrastructure savings		$65 to $130
More efficient outsourcing of design	up to $50	
Better communication	up to $500	
Efficient use of designer time	up to $1,000	
Avoid internal translation costs		up to $6
Reduced training costs		$40 to $60
Simplified environment		up to $5
Reduced drawing standards		up to10
Paperless releases		up to $50
Software release process		$1 to $20
Protection of IP	up to $100	
Reduced steps in incoming data	up to $30	
Increased supplier leverage		up to $70
Promotes multi-site 24-hour design		up to $350
Quantity and frequency of data exchange		up to $12
Total savings per $1 M revenue	as much as $1,500, with larger suppliers having the greatest savings	$200 to $600, with larger suppliers falling at the lower end of the range

Table 1. Hard and soft savings in dollars of savings per million dollars of supplier revenue.

These results do not take into consideration savings the OEMs would enjoy. In general, their savings will probably fall into the soft category and will be represented by their ability to produce better vehicles faster and at a lower cost, due to better and more-consistent data exchange. The OEMs will also have more flexibility in selecting supplier partners, in that they will not be dependent on just those that have the same CAD systems they are using.

Individual suppliers may look at these numbers and disagree with the specific values assigned to each type of savings. In aggregate, however, they will probably find that their estimates are roughly comparable to those derived by this study. Cyon Research believes that industry-wide adoption of a single data-exchange standard will result in significant savings for all parties involved in the design and manufacture of automobiles and trucks.

About Cyon Research…

Cyon Research is a consulting firm that provides design, engineering, construction, and manufacturing firms with a strategic outlook on the software tools and processes they rely on to create the world around us. Cyon Research also supports the vendor community with its unbiased insight, vision, and expertise to help them understand the complex nature of their markets and grow, by serving the needs of their customer base.

Cyon Research brings to its clients a unique combination of experience, perspective, and insight, supported by an extensive network of well-established industry relationships. Our close contacts throughout the user, analyst, vendor, and developer communities provide surprising benefits for our clients and add significant value to our services.

Those relationships are enhanced by our publications and events. While consulting is the heart of our activities, our publications, *CADCAMNet* and *Engineering Automation Report*—are our voice. Through them, we connect daily and monthly with the user and vendor communities. And COFES: The Congress on the Future of Engineering Software, our annual, invitation-only event, is our face—the place where we can make the types of connections that just aren't possible through any other means than face-to-face.

The focus of our research within the realm of design, engineering, construction, and manufacturing is technologies and markets that are likely to become real within the next two to six years.

The domain of our research is the tools, processes, and procedures used in the design, engineering, management, and production of the built environment and manufactured goods.

Funding for this white paper was provided in part by JT Open. Watch CADwire.net for additional Cyon Research white papers.

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