



PLM PDM EXPERIENCES

# "reUse"

## The secret of the most competitive industrial companies

Accelerating reuse of parts is a key step to increased competitiveness in the world of industry. Manufacturers and experts share their secrets for a successful reuse strategy.

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## "reUse", a key step in the search for competitiveness

In today's world, due to market globalization and technological acceleration, industrial companies are required to cut costs and reduce product design time. In recent years, they acquired parametric CAD, PDM and, sometimes, PLM\* software to reach their acceleration goals. Progress has been made, but must go much, much further. One of the keys to reaching these goals is to encourage the reuse of components and processes that already exist in the company. The most obvious source of savings is at the design office level where designers spend much of their time recreating components that already exist. This phenomenon varies significantly by industry, but according to an Arthur D. Little study, up to 80% of an engineer's work is identical (or almost) to something that has already been done within the company. The ability to avoid recreating components can lead to significant time savings and many other savings in a domino effect throughout the product lifecycle.

Fewer parts in stock represent a source of savings at the production, storage and after-sales service levels. Savings can also be expected in terms of time-to-market and at each level in the product lifecycle.



An LMI study\*\* performed for the U.S. Department of Defense estimates that each new part added to inventory costs \$27,500 on average. Thus, to reduce the costs of its low-cost Dacia range, Renault drastically reduced the number of parts. A Logan contains at most 6,000 parts, whereas a traditional sedan contains 10,000. But Renault also turned to its stocks of parts for other vehicles in the group, including Renault and Nissan, to create this range. Seventy percent of the Duster, the recent success of the Renault brand, is made up of parts that already existed. The result was that the Duster was put on the market only three years following the decision to launch this low-cost 4x4, and its price is 20% to 30% less than that of its competitors.

### Process implementing is long and complex

The challenge therefore consists of implementing processes, particularly at the PLM level, that encourage designers to make the reuse of components a priority. All departments involved in the product lifecycle should adopt this approach, not just design offices. All players must have access to tools to be able to find the part they are looking for, from the purchaser to the after-sales service department, including the methods and manufacturing departments.

Moreover, a study conducted by the McDermott firm in 2005 showed that "knowledge workers" spent 38% of their time searching for information. The case of 3D designs of parts is unique. Users must be able to perform searches on all the technical features, the design and manufacturing BOMs, as well as on all documentation associated with the part, from maintenance handbooks to supplier orders. Moreover, design engineers prefer to search using the shape of the part. With EXALEAD OnePart, Dassault Systèmes is the first software publisher to offer a solution that can link these two worlds that were, until now, separate. ■

\* Parametric CAD: Operating mode of Computer-Assisted Design software used to define an entity with parameters that can be easily modified.

PDM: Product Data Management

PLM: Product Lifecycle Management

\*\* Logistics Management Institute study for the US Defense Logistics Agency – April 2012

## “Always be sure that our designers use the right parts”

Ingersoll Inc. designs machine tools for Boeing, Airbus and Caterpillar, and is a high-performing manufacturer in terms of time-to-market. With OnePart, it intends to save costs by increasing the reuse of existing parts.

Ingersoll Machine Tools, Inc. (IMT) is an American manufacturer that produces medium- and large-scale machine tools for cutting metals and composite components. Its most prestigious clients include Boeing, Alenia, Airbus and Spirit Aerospace, who employ IMT machines to create airplane parts in composite components, and Caterpillar and BAE Systems. The company uses Dassault Systèmes tools to design its machines and components. It also integrates Dassault Systèmes software components in its own solutions, in particular its composite fiber placement machines. The company’s design office is based in Rockford, Illinois, where 20 to 25 engineers work on machine design. They use CATIA from Dassault Systèmes as well as AutoCAD and the PLM ENOVIA SmarTeam platform. “We design some 2,000 new parts each year and I would say that the rate of reuse of existing parts in our new machines is in the neighborhood of 25%,” states Clarissa Hennings, Business Development Manager for IMT. The company is seeking to further increase this rate, even though it sells machines that are quite different from each other and that are composed of very different parts.

To reach this objective, IMT tested the EXALEAD OnePart solution to improve its ability to search its own PDM. “We want to be able to perform more efficient searches and be able to make these searches more selective. In this regard, OnePart delivers the best results because it offers more filters than our current database. In terms of savings, I believe we can save up to 5% on time currently spent on searches. If we look at these savings in light of all the parts designed here every year, we should be able to reduce this number by at least 2.5%.”

IMT is planning to deploy OnePart at the start of 2015. Initially, the software will be accessible to only CAD designers and engineers. “OnePart can also be used in manufacturing workshops, processing planning, purchasing and sales departments, but we have chosen to start with the engineers. After the first implementation stage, we will assess the savings before expanding access to other departments in our organization. In the second phase, the solution will be deployed more widely to include the management and manufacturing departments,” adds Ms. Hennings.

While IMT considers itself to be very efficient with respect to the time-to-market of machines, it continually strives to improve its performance, in particular when it comes to launching new products.



### Ingersoll Machine Tools, Inc.

**Activity:** Manufacture of machine tools

**Headquarters:** Rockford, Illinois (USA)

**Offices in the United States, Europe and Asia**

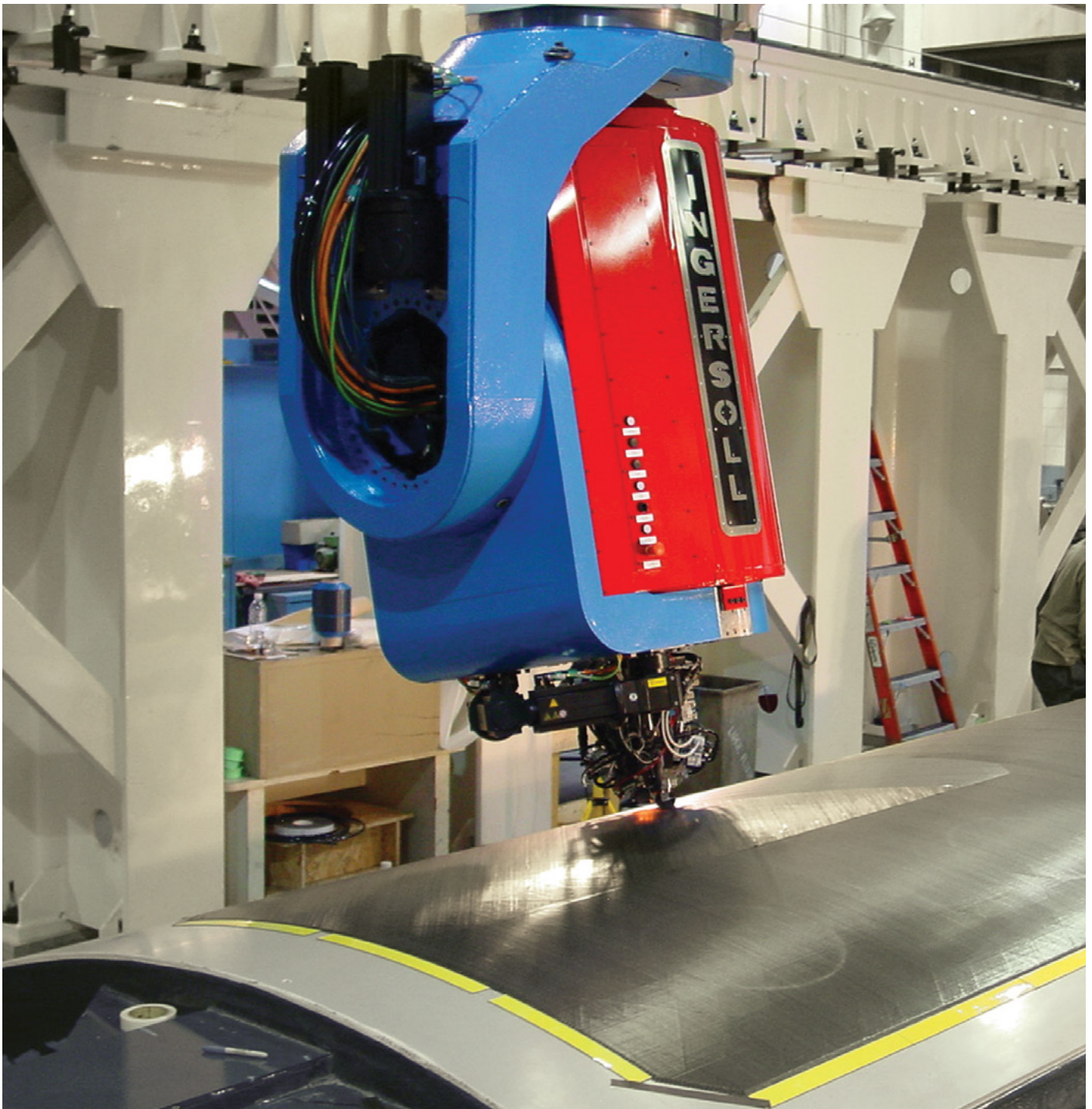
**Employees:** 200

#### The OnePart project:

- 64,100 parts stored in SmarTeam
  - 3,500 parts per machine on average
  - Average cost per part: \$18,000
- ROI of the OnePart project: 4.3 months

Source Ingersoll Machine Tools

Like many manufacturers, one of its major objectives is to reduce the cost of the OnePart project. "Another area in which we believe software such as OnePart could assist us is in the way in which we intend to propagate innovation on both our existing machines and our new machines. In particular, we hope to reduce the number of duplicated parts in our PDM and be sure that the most recent parts are used in SmarTeam. OnePart gives our designers less margin for error," concluded Ms. Hennings. ■



## “We want to help our users find parts that already exist in our PLM”

A world-leading manufacturer, Volvo Bus has design offices on numerous sites worldwide. With OnePart, the Swedish company aims to facilitate its 600 designers finding and reusing parts.

Each year, Volvo Bus, a subsidiary of the Volvo group, delivers approximately 9,000 buses and coaches worldwide. Each bus company, however, has its own requirements and wishes to customize the buses it puts on the road. For this reason, Volvo Bus has a number of production sites globally, each with its own design office for customizing the buses and coaches designed in Sweden. Anders Fors, CAD and PLM Manager, states, “Volvo Bus has design sites not only in Sweden, but also in Mexico, Brazil, Poland, India and Canada. We have some 600 CAD users on these sites. We operate on the principle that even the smallest site must have its own design center. Our platforms are developed at the global level, but we customize our vehicles at these design centers.”



Volvo Bus offers its clients a wide range of options. “We never sell the same bus to two clients,” acknowledges Dan Larsen, PLM Platform Manager for Volvo Bus. He adds, “There are between 500 and 1,000 options for a single vehicle, making for many possible combinations. We now operate on an order-driven basis to build our buses.”

All Volvo buses and coaches are 100% designed using CATIA CAD software from Dassault Systèmes. The manufacturer has developed its own PLM called KOLA (for Konstruktionsdata Lastvagnar), which comprises the standard PLM platform for the Volvo group. “450,000 different objects are currently stored

in this repository,” adds Mr. Larsen. “This number includes only designs for Volvo Buses and Coaches, and those for our partners, including drawings as well as assemblies. In addition, we have a parts library that is shared with the group.”

Traditionally, Volvo encourages its designers to reuse parts, but it is sometimes difficult for them to find parts that already exist. Too many options are available to the designer, which means it takes too long to find which part to reuse or not.

With OnePart, Volvo Bus has a new tool for filtering data and helping its designers find the right part. “This is valid for CAD users, of course, but also for users at the manufacturing, quality service, methods, and procurement levels. After an initial launching for CAD users, we intend to introduce the 3D tool to all user populations,” adds Mr. Larsen.

For confidentiality reasons, Mr. Fors does not want to reveal the details of the ROI calculation that encouraged Volvo Bus to acquire the OnePart solution. But for the purposes of this calculation, the company has assessed the cost of each part designed by its engineers for all of its automotive projects. “We have estimated the number of parts that we no longer need to redesign, and have thus assessed the savings generated by the project.”





Every part saved in this way represents a considerable savings for the manufacturer. "We have estimated that we can save more than SEK 100,000 (€10,600) over the entire lifecycle of a part, from design to manufacture to after-sales service," states Mr. Fors. Given that a bus is made up of 3,000 different parts, and that a part can 'live' in Volvo's PLM for some 15 years, the savings that can be generated are potentially very high. ■

### Volvo Bus

**Activity:** Bus and coach manufacturer

**Headquarters:** Göteborg (Sweden)

**Personnel:** 6,648

9,000 bus & coaches sold in 2013

**Sales revenue:** SEK 16.7 billion

*Source Volvo Bus*



## “From the satisfaction of creating to the satisfaction of finding”

At the head of mechanical architecture for powertrains at the PSA group and then Managing Director at Peugeot-Citroën Moteurs for nearly 15 years, Philippe-Henri Leroy is today a proponent of increasing the performance of R&D and manufacturing processes in French enterprises and accelerating innovation processes for breakthrough technologies.

### Why should manufacturers implement a reuse strategy?

It is important to understand that an innovation does not necessarily mean an ingenious invention that is going to change everything. Briefly, innovation means above all making a product or a service available to users that resolves a problem or provides enjoyment, or both. To innovate is one thing, but industry should seek to create innovative components quickly, assemble these components quickly and assemble them with each other. To innovate efficiently is to reuse information to innovate, but today industry must ask itself how it can reuse a company's legacy assets in the most efficient way.

When we manufacture an automobile or an airplane engine, the fundamental technology does not usually change. There are breakthrough innovations, and then manufacturers continue on this basis for about a decade. When we design a new product, we must be able to find previous developments in the processes. This is where it becomes extremely important to make the legacy assets accumulated by the company available to designers efficiently and simply, whether modules, components, 3D models, products, processes or machine tools. The components must be able to be reassembled in a very simple way to create new innovations.

### Currently, what are the factors that are holding back the acceleration of reuse by design offices?

As the head of a design office for some 15 years, I have observed that a major factor holding back the acceleration of reuse is the behavior and uncertainty of engineers who do not find the attributes or the elements associated with a product easily and do not know where to turn.

“Leave well enough alone.” We have all been trained in an educational environment where we were taught that we can always do better. We want to encourage people to do better but this is a real hindrance to reuse. Another factor is that if it is not done here, it is not good, which is typical to French culture. We must make room for creativity, without always wanting to recreate everything. The third factor that I see here is local optimization. The strategy of large enterprises is to optimize planning, but not at a global level.



Philippe-Henri Leroy  
Consultant-President  
Founder  
Upsilonexperience SAS

### How can we encourage engineers to find and use legacy assets?

Man likes to create and if we do not replace this satisfaction with another, reuse will not take place naturally. And it is difficult to find things that already exist. Finding a CATIA design ten years after its creation is not easy. What can we do to make it enjoyable for our designers that will encourage them to reuse assets without frustrating them? Above all, we must be able to deliver the information they are looking for rapidly. Finding what we want quickly is a reward we have seen with Google.

The other reward is to be able to control the search, providing users with the possibility to direct the search, along with a certain amount of liberty geared to a binary system that finds the element or doesn't. The concept of a discovery lends additional enjoyment to the search.



### Under which circumstances should reuse be implemented?

To be frank, I would say that industrial companies today have a strong base made up of multiple functions, modules, tooling, etc. This is a legacy that can be used on a number of levels. It can be used for the PLM, whether at the design creation, design, development manufacturing, production or maintenance level. All phases in the lifecycle must be underpinned by a reuse approach.

We mustn't forget, however, that this search for diversity has its limits. Obviously, we must aim to prioritize time savings with high added value to save development and tooling time. We must also concentrate on volume. When we manufacture cars, we are required to keep spare parts in stock to meet client needs for ten years after the end of the vehicle's manufacture. This is sleeping stock that costs money and reuse means that, in this phase, we can be more efficient if we reuse these parts in products still in production.

### Can you give us a few examples where this strategy has succeeded?

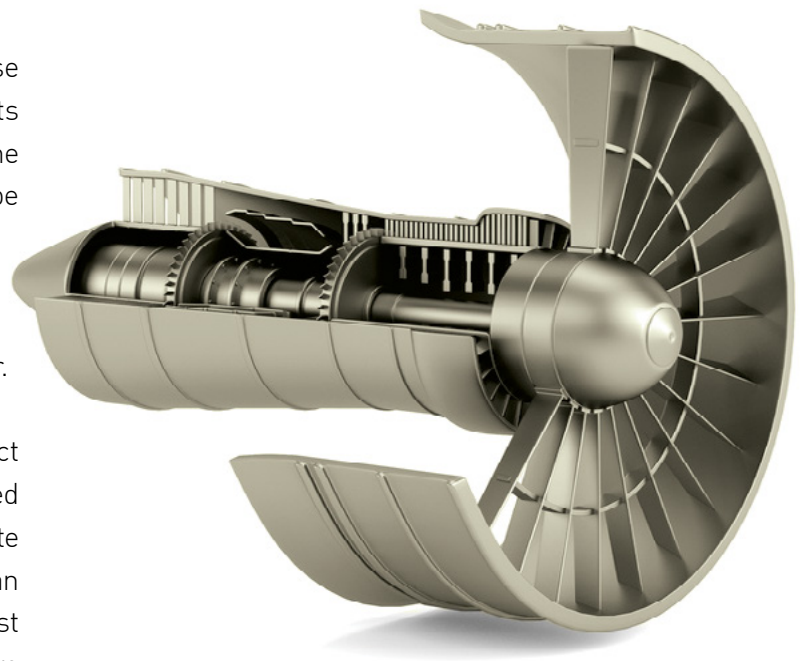
There are a number of strategies to accelerate a reuse approach in enterprise. The design of modular objects is one. We determine the design rules for creating the fixed parts of one side and the parts that are likely to be subject to variations of the other. Manufacturers of compressors, for example, do this. This approach is used to considerably reduce R&D expenses on the order of 44% for a supplier and 24% for a manufacturer.

Another example of reuse can be seen in Lean Product Development. Toyota, with whom PSA has produced vehicles in the past, has now reached a reuse rate of about 60% to 70% on its new vehicles. This is an approach that we have adopted at PSA on exhaust manifold ranges, for example. For new vehicles, we encourage the reuse of technologies developed on other models, with significant savings. A car has approximately 8,000 parts, and an engine between 250 and 320 parts. You can see the advantage of reusing parts and reducing diversity in manufacturing units!

### How can we implement this strategy?

As with any other change, we must change behavior, in particular through training, and transform management. And of course we must drive the process by introducing new methods and tools. The approach must be present in all six phases of the product lifecycle, from design creation, to development, to manufacture, production and maintenance. It is absolutely essential to introduce this search for reuse systematically in the processes involved in each phase: in the management of reproduction, extrapolation, standardization and consolidation actions.

Tooling these processes with a "search" type solution such as OnePart from Dassault Systèmes can be key to meeting this challenge and providing the satisfaction in managing the inventiveness of designs. Paired with PLM and management processes piloted with an industrial performance monitoring dashboard, these new-generation tools will lead to a real rational use of industrial technological databases and thus take competitiveness to a new level. ■



## “We’ve known for some time, implementing a ‘reUse’ approach is not easy “

### Why has EXALEAD chosen to position itself on the reuse market with the OnePart offer?

The reuse approach is not a completely new concept. Design offices have been interested in this for a number of years. It’s a concept that is most notably part of the Kaizen approach made popular by Toyota in the 80s. Although the idea has been around for awhile, implementing it is not easy. For example, it took Volkswagen 14 years to switch to the modular approach that’s the basis of its success today. A modular approach is one method available to manufacturers to increase the reuse rate of parts.



Morgan Zimmermann  
CEO EXALEAD  
Dassault Systèmes

To illustrate the advantage of this approach, if we take the case of the automobile industry, the average cost of introducing a new part is on the order of 1,000 euros per year. This cost will run over some 20 years. These are significant amounts. A medium-sized European manufacturer designs between 3,500 and 4,500 new parts each year. A reuse strategy can reduce the number of new parts that weigh down a company’s fixed assets, but can also free engineering capacities, which leads to faster innovation and reduces the time-to-market of new products by capitalizing on the company’s know-how.

Methods have been implemented and this approach works well when we are dealing with expensive parts. However, reuse has clearly been neglected for parts of lower value, essentially because manufacturers did not have simple tools to do so. This is the purpose of OnePart.

### What does OnePart deliver from a technical point of view that other traditional tools do not?

The Google generation is arriving in the workplace. Young engineers want search tools that are as simple to use as Google. This means access to software that is able to provide answers instantly without training, even if these answers are imprecise. OnePart can search all the company’s data assets, as well as all modelling data, to find the 3D part that most closely matches the original request. The user can then filter the responses using the part’s attributes and shape. Users have search criteria for data stored in ERPs, the company’s databases, data found in all types of documents relating to the product as well as BOMs. They can also delve into the 3D model itself. The search can thus take into account all the part’s specifications, including its geometry, holes and bevels, in fact, all the elements that designers are accustomed to handling. But other employees can also benefit from OnePart, including engineers responsible for manufacturing methods, as well as maintenance technicians and purchasers.

### How does a search work using OnePart?

The power of OnePart is based on all metadata relating to the part, whether structured or not, and combining this knowledge with the morphology of the part. Similar to how Google references websites, the EXALEAD engine calculates a similarity score between parts to display the parts that most closely match the user’s request.

This meta/morpho search browses the data using a model of the part. We recreate intelligence through browsing. Designers begin their search with the function and certain preconceived ideas. The software limits the field of possibilities and in less than two minutes, the search converges on the right part by exploring similarities. This is a highly intuitive approach that can be implemented by both engineers and purchasers, and even by workshops and warehouses with Siri type voice piloting.

**Which sectors are the most likely to benefit from these types of tools?**

Our first targets for this solution are engineering companies including the automobile industry, the aeronautics industry, and companies that create complex machines. Another sector that could benefit greatly from a tool such as OnePart is the electronics industry. BAE Systems realized that they had a large number of duplicates at the electronic component purchasing level. They may have had up to 110 equivalent components. With a tool that can be used to quickly find similar products, purchasers can concentrate on buying parts at the best price, and bulk buy using fewer references.

Offers are becoming increasingly complex in a growing number of sectors and they need to deploy this reuse approach. I am thinking in particular of the medical equipment sector.

**Is this type of solution complicated to implement?**

Large-scale projects take between 20 to 30 days to deploy, which essentially involves implementing the connections with the company's existing systems such as ENOVIA or SAP. Once the architecture is in place, document indexing is very fast. This has been an advantage of EXALEAD since its creation. We were able to index all 6 billion of the Italian government's tax returns in a single night, so volumes generally encountered with respect to large manufacturers do not present a problem for our algorithms. For one of our clients, we indexed 196,000 parts in 6 hours, with data distributed between Japan and the United States. With this implementation, indexing is incremental, and some 1,000 parts are added to the index each week. ■

**DASSAULT SYSTÈMES**

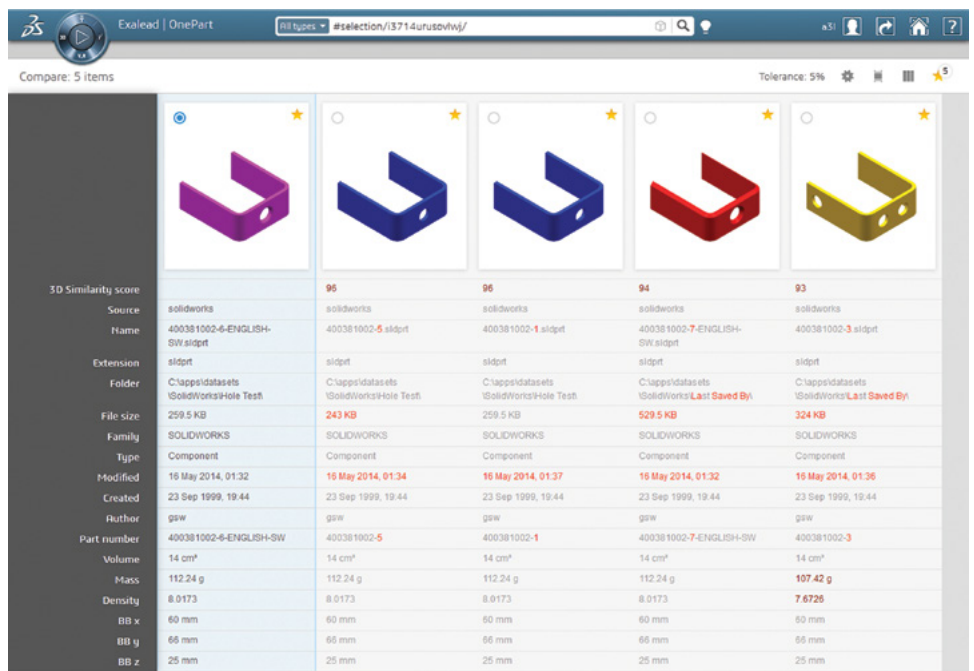
EXALEAD is a brand of Dassault Systèmes

**Activity:** Software publisher

**Employees:** 13,300

**Sales revenue:** \$3.2 billion

*Source Dassault Systèmes*



EXALEAD OnePart Interface Comparison using similar shapes associated with the comparison of metadata from the PDM and additional data sources.



## What ROI can we expect from a "reUse" strategy with EXALEAD OnePart?

### Illustration of a real case from the aeronautics industry

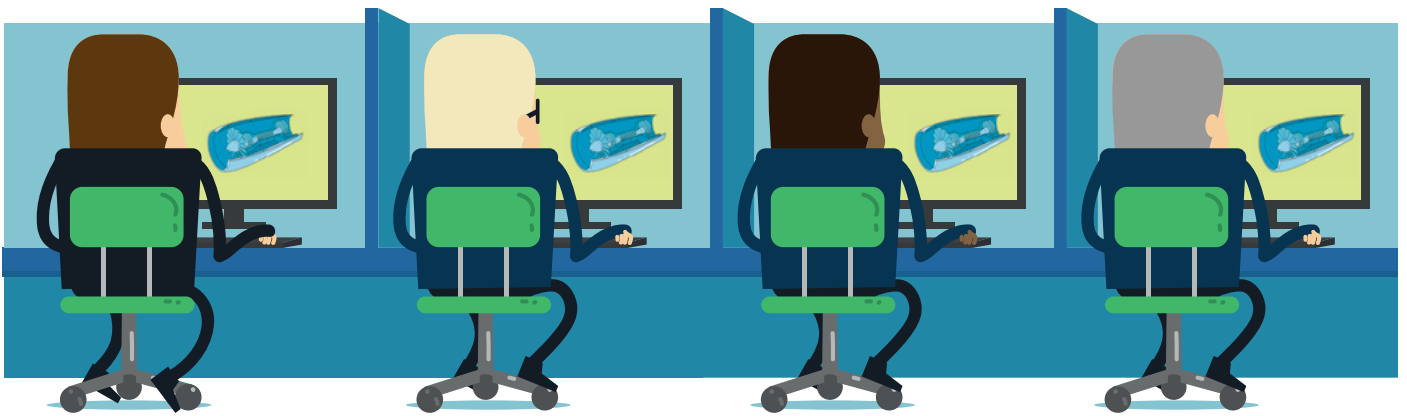
Implementing a systematic reuse policy – the reuse of existing parts – is a source of considerable savings, and not only at the design level of new parts. An example from the aeronautics industry, where the price of parts is very high, shows that savings can be realized at various levels, from the design office to manufacturing, process engineering, purchasing and after-sales services.

#### In the Engineering Department

All CAD designer workstations have access to the OnePart solution in order to encourage engineers to reuse existing parts as much as possible. Studies estimate that 40% of their time is devoted to searching for information in existing models and product data. An improvement of 5% is conservative.

*Results*

200 workstations equipped  
5% in time savings  
Savings: **\$500,000/year**

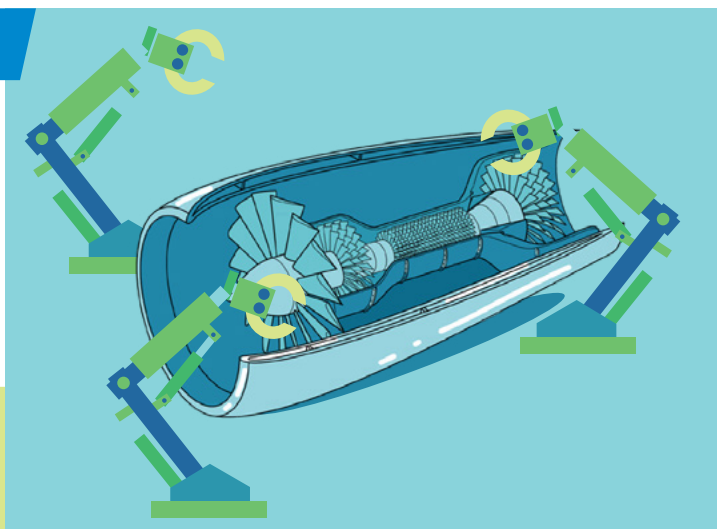


#### In the Manufacturing/Production Department

Finding the manufacturing data of a part that has already been produced or of similar parts leads to significant savings. Access to the platform is reserved for managerial workstations: 15 in this case.

*Results*

15 workstations equipped  
8% increase in efficiency  
Savings: **\$80,000/year**





### In the Methods/Quality Department

Results

15 workstations equipped  
10% increase in efficiency  
Savings: \$60,000/year

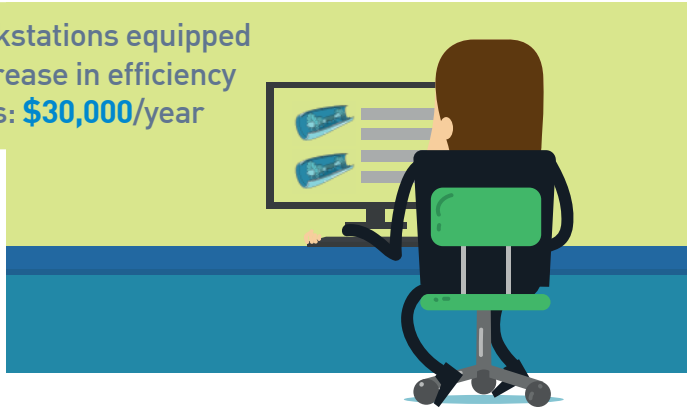
The methods office, on the lookout for duplicate parts or parts not listed in systems, is in charge of converting BOMs created by the engineers in the design office into the manufacturing BOMs used in production. A solution like OnePart is used to help choose the best part to reuse in manufacturing.

### In the Purchasing Department

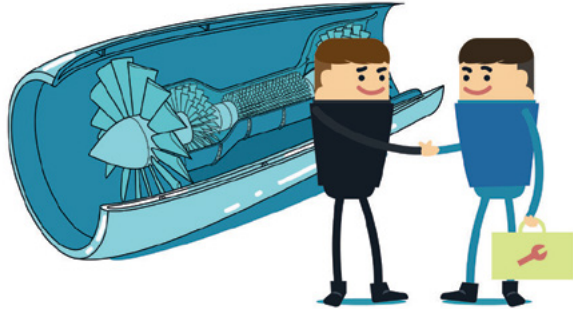
The buyers in charge of procuring parts from sub-contractors can navigate all catalogs of interest to find equivalent parts at a more favorable price or available within a shorter period of time.

Results

10 workstations equipped  
5% increase in efficiency  
Savings: \$30,000/year



### In the Sales/After-Sales Department



Results

10 workstations equipped  
10% increase in efficiency  
Savings: \$60,000/year

It is easier for the after-sales department to manage procurement with fewer parts. Operating costs are lower, while client satisfaction is increased by higher availability rates and shorter repair time.

### Company Savings

Number of parts in inventory: 500,000  
Parts reused on average: 7,500

Number of parts created/year: 10,000  
Rate of reuse: 8%

Cost of implementing the EXALEAD OnePart solution

\$501,780 in Year 1  
then \$74,120 per year

Savings

\$4.33 million

Amount linked to production:  
\$730,000/year

Amount directly linked to reuse:  
\$3.6 million

ROI:  
1.8 months

## "reUse"

# The secret of the most competitive industrial companies

When industrial engineers and designers can display the existing data for a component instantly, savings are immediate and ROI is quick for the entire company. This has a positive impact on engineering efficiency, reduces risk, improves quality control and stock management, optimizes the entire production chain and reduces time-to-market, leaving more time for innovation.

With this guide, you can learn of the experiences of industry players and IT experts who bear witness to the advantages of reuse in a very concrete way.

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For more information, to view a live demo of EXALEAD and for purchasing information, please contact your Rand 3D representative:  
1.877.726.3243 ext. 4338 | [www.rand3d.com](http://www.rand3d.com)

