Demonstrating cost reductions of 20% to 63%, this White Paper tells the true story about Return On Investment and helps you establish a business case for S1000D.

EXECUTIVE SUMMARY
Is your customer demanding support for a new data standard and advanced technical information resources while your organization is facing budget cuts? If so, you are not alone. This has become a typical scenario in today’s aerospace and defense industry, where budgets are tighter than ever, particularly when it comes to technical publications.

Ensuring that technical information is accurate and up-to-date is only half of the battle for today’s technical authoring teams. With the widespread use of Interactive Electronic Technical Manuals/Publications (IETMs/IETPs), customers have high expectations for intelligent information resources. Maintenance and repair organizations have enjoyed measurable benefits from the use of interactive information—benefits such as faster look-up times, reduced training costs, tasks performed correctly the first time, fewer broken parts, and faster turnaround of aircraft and equipment during repair and maintenance visits. No one wants to give up these gains to offset budget cuts in technical publications. In other words, you need to do more—with less.

This is where S1000D comes into the picture. It makes so much sense to author and manage technical information in data modules that the benefits to content reuse and multi-channel publishing are easy to recognize. And since S1000D is an international standard used by aerospace and defense companies worldwide, using it will position your organization for future business. But—is the risk involved with adopting S1000D worth the potential cost savings? What about the investment that needs to be made in technology, training, and implementation? And how can you justify such an investment at a time when budgets are so tight?

After reading this White Paper perhaps the right question to ask is—how can you not justify such an investment?

This White Paper explains how S1000D is able to drive cost savings by using real-world ROI case studies from the Defense and Energy sectors. It discusses how manufacturers of mission-critical systems have achieved ongoing cost benefits in a number of surprising areas beyond content reuse and improved quality, and will explain how increased system availability and technician efficiency can contribute to your overall return on investment in S1000D. We hope you find it helpful in assessing how S1000D will impact your organization’s productivity and ongoing production costs.

The White Paper is based on a webinar presented by CORENA and Data Conversion Laboratory (DCL).
In order to intelligently discuss a return on investment, we need to consider the challenges and cost drivers associated with the production of technical publications. In today’s environment, the following list of challenges is typical:

- Decreased budgets
- Decreased time to create new publications/IETMs
- Decreased time to update publications
- Multi-channel publishing requirements
- Requirements for intelligent and interactive electronic technical manuals
- Need for interoperable data
- Globalized workforce and need to interchange content with partners and customers

Requirements around interoperability, content reuse, and multi-channel publishing very quickly point us toward the effective use of XML. And more specifically, toward the standard that was developed to address these challenges for the aerospace and defense industries: S1000D.

S1000D is an international specification for the procurement and production of technical publications that is based on XML (or eXtensible Markup Language). Used heavily in aerospace and defense, S1000D has gone through extensive revisions under the auspices of the S1000D Steering Committee, and members include the AIA, ASD and A4A. It has a very active user community and extensive vendor support—all of which point to S1000D as a standard that will continue to be used for many years, even as technology improves and user expectations grow. Therefore, it is a good choice for documenting complex equipment with long lifecycles, such as aircraft, ships, submarines, and rail.

But more importantly, S1000D can drive significant cost savings because of the capabilities it provides:

Content re-use
- Reduces the effort to create/update technical information
- Increases quality and consistency of manuals
- Decreases the amount of data that needs to be maintained/converted
Multi-channel publishing
- XML can be rendered to paper and various electronic forms for computer and handheld devices
- Different output of the same data is possible (e.g. customized manuals for specific aircraft configurations or tail number ranges)

Data interoperability and interchange
- XML provides for data integration, analysis and interchange
- Enables platform standardization

If you see a correlation between the capabilities of S1000D and the challenges and cost drivers facing technical publications, that is because the specification was designed with these very factors in mind.

S1000D BUSINESS CASE CONSIDERATIONS

NEW PROGRAMS
If you are working on a new program, the decision about whether to use S1000D will probably be an easy one. This is because you will likely be mandated to deliver your data in S1000D XML rather than an older MIL-STD or ATA SGML format. S1000D is an excellent choice for a new program as it ensures data interoperability and longevity as adoption of this international standard continues to grow. Because S1000D is used by both military and commercial programs, data can be multi-purposed for military derivatives of commercial equipment and vice versa. As vendor support and development for S1000D continues to grow and be maintained, the development and tool support for older military and civil aviation specifications will not—especially with limited funds available.

All of these factors contribute to the business case for S1000D. And for a new program, these factors can be enough to justify S1000D adoption, even without showing a return on investment.

EXISTING PROGRAMS IN NON-XML FORMAT
If your data is in non-SGML or -XML format, your business case for going to XML will require you to consider the cost of data conversion, retooling and user training. However, it is possible that a good business case can be made for the adoption of S1000D based upon the factors mentioned earlier. In fact, an overall cost reduction of approximately 60% over legacy manual production costs is typical for organizations who have converted their non-structured data to S1000D XML (independently reported by customers of both Data Conversion Laboratory and CORENA).

For new programs the decision whether to use S1000D should be an easy one!
EXISTING PROGRAMS ALREADY IN XML FORMAT

If your data is already in a non-S1000D SGML or XML format, the business case for S1000D becomes more challenging since many of the benefits of S1000D also apply to any SGML or XML-based specification. With that said, there is a difference between SGML or XML specifications that are structure-based versus content-based. Structure-based specifications such as MIL-STD-38784 define the structure of a publication but do not classify its content, thus limiting the types of information that can be gleaned from the data. In contradistinction, content-based specifications such as MIL-STD-2361 classify content as well as defining structure.

Since S1000D is a content-based specification, the largest improvement in data utility is achieved when you convert from a structure-based specification rather than a content-based specification.

Nevertheless, there are still considerations regarding vendor tool support, data format longevity, and the cost of maintaining multiple publishing environments that contribute toward a favorable business case for S1000D. And in the final analysis, since S1000D is the future of technical publications for both military and civil aviation programs, it may make good business sense to standardize on S1000D.

WHAT IS INVOLVED WITH S1000D IMPLEMENTATION?

DATA CONVERSION FOR LEGACY PROGRAMS

If you are working on a legacy program, you will probably need to consider the requirement for data conversion. Depending on the data format, as mentioned above, this could be a potentially expensive process—so it is important that this is done by those with S1000D expertise, and that the data analysis is performed correctly.

XML AND S1000D SKILL SET

Your technical authoring team will need an XML skill set and will need to understand the specific XML authoring requirements involved with S1000D.

S1000D BUSINESS RULE DEVELOPMENT

Depending on where you are in the supply chain, you may also need to develop S1000D Business Rules before you begin authoring. (For more information about S1000D Business Rules, see CORENA’s White Paper, “Understanding S1000D Business Rules” on www.corena.com.)
Finally, S1000D requires technology in order to take advantage of all the opportunities for cost savings that it provides. This is not something you want to try to do on a file system. You will not see the cost benefits described in this White Paper without using technology that leverages S1000D with automation, content reuse, and multi-channel publishing. Two key pieces of technology are needed for you to fully leverage S1000D:

- An S1000D Common Source Data Base (CSDB) is critical to S1000D production, and if you open the S1000D specification itself, you will see that a CSDB is called for right on the title page. A CSDB is essentially a content management system that has been specialized for the purpose of managing S1000D data and which addresses the requirements prescribed for a CSDB in the S1000D specification.

- Interactive Electronic Technical Publications (IETPs) may be a required deliverable for your S1000D project in addition to paper or PDF. Fortunately, S1000D was designed with multi-channel publishing in mind—so a good CSDB will be able to easily provide outputs to both PDF and IETP from the same S1000D publication module. An IETP will allow you to fully exploit the capabilities of S1000D by letting your information consumers filter data by aircraft tail number, conditions, or equipment type, as well as providing a platform for many different types of S1000D content, such as animations, simulations, 3D models, video, and more.

**TECHNICAL PUBLICATIONS COST AND VALUE DRIVERS**

Some of the most significant cost drivers faced by technical publications organizations today include:

- The need to document multiple configurations of multiple variants of multiple products; if this leads to the duplication of content (and it often does), the effort and cost to maintain that content is also duplicated.

- The requirement for multichannel publishing to produce a variety of formats such as PDF, IETP, HTML, or XML and a growing list of devices such as smart phones and tablets; multiplying the number of required output formats can also multiply the cost of producing your documentation.

- The need to interchange and track data deliveries across multiple organizations within a global supply chain; managing and tracking data deliveries
manually can lead to mistakes, incorrect deliveries, the need to repackage and redeliver data multiple times and worst of all, data loss—all of which drive costs upward.

S1000D was developed with these very specific problems in mind, and can help you realize significant cost savings if implemented in the right way. To do this, you need to focus on the following value drivers:

- Reduction of the effort and cost to author, manage, publish, and maintain technical publications; this can be accomplished with S1000D-driven content reuse and automation.
- New additional revenues coming from advanced IETPs and parts ordering.
- Being able to charge a higher price as a result of improved quality.
- Generating significantly more revenues by increasing availability of mission critical systems.

So with this in mind, let’s look at the traditional way of handling projects—either at a Defense Logistic Organization or at a Systems Integrator.

Typically, a prime contractor gets logistics support information from several suppliers. These suppliers in turn get their logistics support information from several sub-suppliers. This would comprise a total system, except that the defense organization or systems integrator is likely to have several projects with similar characteristics.

For example, a helicopter manufacturer may have several programs, but with several common components (from the same sub-supplier). The defense logis-
tics organization may have several army programs, also consisting of several common units across a system platform. In such a traditional set-up, interoperability is poor. It is inefficient. And it is expensive. Now, let’s contrast this with a “standards based” approach using S1000D.

A “standards-based” approach in this case refers to Integrated Logistics Solutions based on industry standards such as S1000D for technical documentation, PLCS for Product Data Management and SCORM for Computer Based Training. Using this standards-based approach, all projects use the same methods, tools, and interchange methodologies between sub-suppliers, prime contractors and customers, making all processes unified and standards-based. Likewise, updating and exchange of information is in accordance with predefined rules.

Business rules define how a project exchanges information and what kind of validation checks are done on information being transferred between parties. This ensures that the information being imported into your CSDB (Common Source Data Base) is always correct. All incorrect or invalid information is rejected and should be returned to the sub-supplier for correction.

With this scenario, the systems integrator or defense logistics organization has one common system across all projects. This means one software infrastructure, one viewing tool, and one set of user competencies that need to be developed. This enables personnel to be used across multiple programs and provides the freedom to choose from amongst a variety of COTS IT suppliers and consultants.

ENHANCED OPERABILITY

When all projects use the same methods, tools, and interchange methodologies, there is a great potential for major cost savings.
ROI CASES

All of this represents the potential for major cost savings and significant quality improvements, both for suppliers and customers.

So now let's look at some real ROI cases. The ROI examples used for this paper are taken from different parts of the Logistics Support Process, but all examples are associated with savings resulting from the reuse of XML-based information.

Some real-life ROI cases include:

- 63% cost reduction by an aerospace engine manufacturer that simultaneously increased the number of parts catalogs from 81 to 132, while reducing the number of authors from 18 to 3
- 20% productivity gain by aircraft mechanics by providing customized job cards (for example, an engine removal procedure was reduced from 100 pages to 30 pages, thus making 200 mechanics more efficient!)
- 48% cost reduction in the production of technical documentation using S1000D
- 20%+ cost reduction in the production of computer-based training by using S1000D and SCORM

Let's examine these last two ROI cases in more detail.

EXAMPLE #1
PRODUCTION OF ELECTRONIC PUBLICATIONS USING S1000D
RESULTS IN 48% COST REDUCTION

In this example, the company had been documenting Integrated Defense Systems for years with MS-Word and structured FrameMaker. They were delivering thousands of units of remote weapons stations to a multitude of platforms and to a multitude of customers, along with ongoing product updates and modifications.

This company did not have a hard requirement for S1000D, but had a desire to increase its aftermarket business and reduce costs. So after determining that the S1000D specification was a good fit for their documentation, they made the decision to move ahead with adoption.

In their existing authoring environment, they had found that the effort to author using MS-Word versus structured FrameMaker were very similar. In fact, the effort for various authoring projects was approximately the same, regardless of whether Word or FrameMaker was used. In other words, just using a “structured” format (FrameMaker) did not make much of a difference in the overall effort to produce technical documentation.

Multiple cost reductions have been reported from organizations having adapted S1000D.
The biggest challenges noted by the company were:

- Lack of configuration control
- Less than optimal reuse of information units

So with these challenges in mind, the company implemented S1000D and focused on the following areas:

- Improved configuration control
- Reuse of information units that are common among different model types
- Improved author productivity (focus on content creation only; no formatting needed)
- After only 9 months, the company was able to demonstrate a 48% cost reduction (in terms of hours) compared to the average of earlier projects. In addition to the 48% cost savings:
  - 87 technical publications were produced in only 3.5 years (that is 2 weeks per publication)
  - Projects can start later and still finish on time
  - More work is accomplished with fewer personnel
  - Revision cycles have been reduced from 3 months to 3 days

**EXAMPLE #2** PRODUCTION OF COMPUTER-BASED TRAINING USING S1000D RESULTS IN 20%+ COST REDUCTION

In this example, the company wanted to reduce the costs associated with producing their Computer-Based Training. The existing methods for creating CBTs involved the use of MS-PowerPoint and special CBT editors, which allowed for limited content reuse and configuration control. This was especially problematic when there were changes to the aircraft.

So the company embarked on a project to reuse 3D models from CATIA together with S1000D data modules. First, the 3D models from CATIA were reduced and converted to 3D XML. Next, scripts were developed to generate a mapping between the 3D XML from CATIA and the XML from the S1000D Data Modules.

The scripts focused on mapping:

- Task numbers
- Task descriptions
- Hot spots on the 3D images
- 3D logic
Mechanics working on an aircraft can now perform Computer-Based Training and Simulation Scenarios in a web-based system. Any changes to aircraft design are reflected in the CATIA models and those changes are mapped (via the 3D XML) to the S1000D based work instructions. This means that aircraft mechanics can now easily update their Training and Simulation environments with minimal effort.

The cost reductions resulting from this project are well over 20%.

CONSEQUENCES OF DEALING WITH PAPER AND/OR ELECTRONIC DOCUMENTS

An energy company performed a study to determine how the availability of correct and intelligent technical information would contribute to the increased availability of their energy facilities. They found that facility availability was impacted by:

- Mean Time Between Failure (MTBF) – this is also known as “Reliability”
- Mean Time To Repair (MTTR) – this is also known as “Maintainability”
- Mean Waiting Time (MWT) – this is also known as “Supportability”

WHAT IS THE VALUE OF 1% IMPROVED AVAILABILITY?

An energy company determined the value of improved availability and was blown away. We’ll show you how to use the calculation for your business!
The major factor that impacts MTBF or Reliability is maintenance. And the consequences to maintenance of not having correct and intelligent technical documentation are:

- Long lead-time to find information
- High risk of using information that is not up-to-date
- Maintenance tasks take longer to accomplish

The major factor that influences MTTR or Maintainability is the ability to repair or maintain equipment quickly and easily. And the consequences to maintainability of having incorrect or non-intelligent content are:

- Long lead-time to find information
- Maintenance tasks take longer to accomplish

There are several major factors that influence MWT or Supportability, including:

- Long lead-time to locate and purchase the right Spares
- Long lead-time to find information
- High risk of using information that is not up-to-date
- High management cost

All of these elements impact the availability of a mission critical system regardless of industry, and all of these elements can be reduced or eliminated by ensuring that users always have access to correct and intelligent content.
AVAILABILITY CALCULATION

Availability, then, is calculated as a function of MTBF, MWT and MTTR. MTBF can be improved by reducing the number of failures (shown in brown in the illustration below). MWT can be improved by quicker reaction times and better preparation prior to a task (shown in grey in the illustration below). And MTTR can be improved by faster repair times (shown in blue in the illustration below).

In the first row (“Before”) of the table above, we see an example of the number of hours spent on different tasks in each category prior to implementing the new process using S1000D. This example shows 90% availability. The bottom row (“After”) shows the impact that having correct, current and intelligent technical information has on the same processes:

- Finding data / documentation was improved from 8 to 4 hours
- Finding spare parts was improved from 4 to 2 hours
- Rework because of wrong instructions was reduced from 2 to 1 hour
- Rework because of misunderstood instructions was reduced from 2 to 1 hour
- Control and test was reduced from 4 to 2 hours

By applying these new values in the formula for availability, the availability would increase from 90% to 94%.

Now consider these two examples of the value of 1% availability as determined by this energy company:

- 1% availability of a windmill is worth 15,000 EUR per windmill per year
- 1% availability of a nuclear reactor is worth 5 million EUR per year

FIGURE 5 - EXAMPLE OF IMPROVED AVAILABILITY

VALUE OF 1% AVAILABILITY:

- 1% availability of a nuclear reactor: 50,000,000 SEK/year
- 1% availability of a windmill: 100,000 SEK/year
When we look at the end-to-end process for the production of technical publications based on the S1000D standard, our experience is that we can save:

- 20% in transforming LSA data to Data Modules
- 45% for Authors using S1000D (we illustrated a case with 48% savings above)
- 60% for Authors of Parts Catalogs
- 20% for Authors of Computer-Based Training (we illustrated a case with 20%+ savings above)
- 20% for improved mechanic efficiency

If we make the following assumptions:

- Hourly rate of 70,00 EUR (or use USD)
- 1 person converting LSA data to S1000D data modules
- 20 authors of data modules
- 2 authors writing IPCs
- 5 authors of job cards
- 10 authors of computer-based training
- (Total of 38 people)
Using this example of 38 people making 70 EUR or USD/hour, improved work force efficiency represents a savings potential of 21,440 hours per year, or 1.5M EUR/USD!

<table>
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<th>Work force efficiency</th>
<th>Persons</th>
<th>Hours/year</th>
<th>Percent</th>
<th>Hours</th>
<th>EUR</th>
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<tr>
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<td>320</td>
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<tr>
<td>Authors of Data Modules</td>
<td>20</td>
<td>32.200</td>
<td>40%</td>
<td>12,800</td>
<td>896,000</td>
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<tr>
<td>Authors of IPC</td>
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<td>3.200</td>
<td>60%</td>
<td>1,920</td>
<td>134,400</td>
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<td>Authors of Job Cards</td>
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<td>8.000</td>
<td>40%</td>
<td>3,200</td>
<td>224,000</td>
</tr>
<tr>
<td>Authors of CBT/Simulation</td>
<td>10</td>
<td>16.000</td>
<td>20%</td>
<td>3,200</td>
<td>224,000</td>
</tr>
<tr>
<td>Aircraft mechanics</td>
<td>50</td>
<td>80.000</td>
<td>20%</td>
<td>16,000</td>
<td>1,120,000</td>
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<tr>
<td>Total</td>
<td>88</td>
<td>21.440</td>
<td></td>
<td>1,500,800</td>
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Savings

<table>
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<th>Persons</th>
<th>Hours/year</th>
<th>Percent</th>
<th>Hours</th>
<th>EUR</th>
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<tr>
<td>Converting LSA data to Data Modules</td>
<td>1.600</td>
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<tr>
<td>Total</td>
<td>21.440</td>
<td></td>
<td>1,500,800</td>
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If we then include intelligent data in an IETP and its impact on 50 mechanics, the savings increase to 37,440 hours or 2.6M EUR/USD!
JUSTIFYING THE INVESTMENT IN S1000D

Determining the likely savings from the adoption of S1000D can now be used to determine how long it will take to realize a return on investment in S1000D training, data conversion, and technology.

In our example above, the total savings from 38 people (without the 50 mechanics) was $1.5M after 3 years. In year 1, only 20% of the savings potential was realized. In year 2, another 50% of the savings potential is realized and the full savings potential was realized in year 3.

Assuming an investment of $500,000 in technology, $20,000 in implementation services and $100,000 in software maintenance, the Net Present Value and Internal Rate of Return over 3 years is highly favorable.

<table>
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<th>Year 0</th>
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<th>Year 2</th>
<th>Year 3</th>
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<td></td>
<td></td>
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<td>Maintenance</td>
<td></td>
<td>$100,000</td>
<td>$100,000</td>
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</tr>
<tr>
<td>Services</td>
<td></td>
<td>$20,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total costs</td>
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<td>$120,000</td>
<td>$100,000</td>
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<td>Total savings</td>
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<td>$330,560</td>
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<td>$274,562</td>
<td>$1,519,868</td>
</tr>
</tbody>
</table>

NPV: $1,519,868
IRR: 86%
Interest rate: 4%

Net savings per year start almost immediately.

AND HERE IT COMES...

This is what you want to show your boss!

NET SAVINGS START ALMOST IMMEDIATELY
And the Break Even point (where the NPV is 0), comes after only about 1.5 years.

If you believe these projections are optimistic, remember back to our first case. They obtained a 48% cost reduction after only 9 months. And for that case we have not yet even calculated the value of improved availability!

WHAT IS THE VALUE OF 1% AVAILABILITY OF YOUR SYSTEMS?

Get in touch if you want us to help you do the calculation!

BREAK EVEN COMES AFTER ONLY 1.5 YEARS

Call us or send us an email at sales@corena.com if you want our help to do a value calculation!
The S1000D standard was designed with a modular nature and many predefined elements for the purpose of improving reuse and interoperability, and thus to significantly reduce the costs associated with the production of technical publications.

Implementing S1000D requires some initial investments and this will depend on your current level of expertise and the formats you are currently supporting. Initial investments may include XML training, S1000D training, XML Editing tools, S1000D Business Rule development, S1000D CSDB and IETP technology and data conversion services.

These investments will be offset by efficiency gains and cost reductions as described above - but to determine your ROI, it is important to understand where the cost savings and benefits will come from. A number of examples and strategies for determining your return on investment have been provided as part of this paper.
ABOUT CORENA

FLEXIBLE, COST-EFFECTIVE SOLUTIONS YOU CAN COUNT ON
CORENA is a global software company and one of the world’s leading suppliers of Commercial-Off-The-Shelf products managing the production, publishing, and distribution of technical documentation for complex and mission critical equipment. CORENA’s products are widely used, primarily by customers within the aerospace, defense and maritime industries utilizing recognized international standards like ATA ISpec2200, S1000D, and Shipdex.

CORENA also offers product independent training and consultancy on projects and analysis of your technical information processes. www.corena.com

ABOUT DATA CONVERSION LABORATORY

Since its founding in 1981, Data Conversion Laboratory (DCL) has remained faithful to its guarantee to construct unparalleled electronic document conversion services based on a rich legacy of superior customization and exceptional quality. DCL is a leading US-based organization organization that currently operates one of the most advanced facilities of its kind, with extensive capabilities to capture data from text from virtually any medium and reformat it to fit a client’s emergent needs.

Specializing in highly complex projects with expertise expertise spanning all industries, DCL provides a world-class mix of services and software resulting in uncompromised quality 100% of the time. Our reputation is built on it! www.dclab.com

Join the conversation at our Content Conversion Strategies group on LinkedIn, and follow us on Twitter @dclaboratory.

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