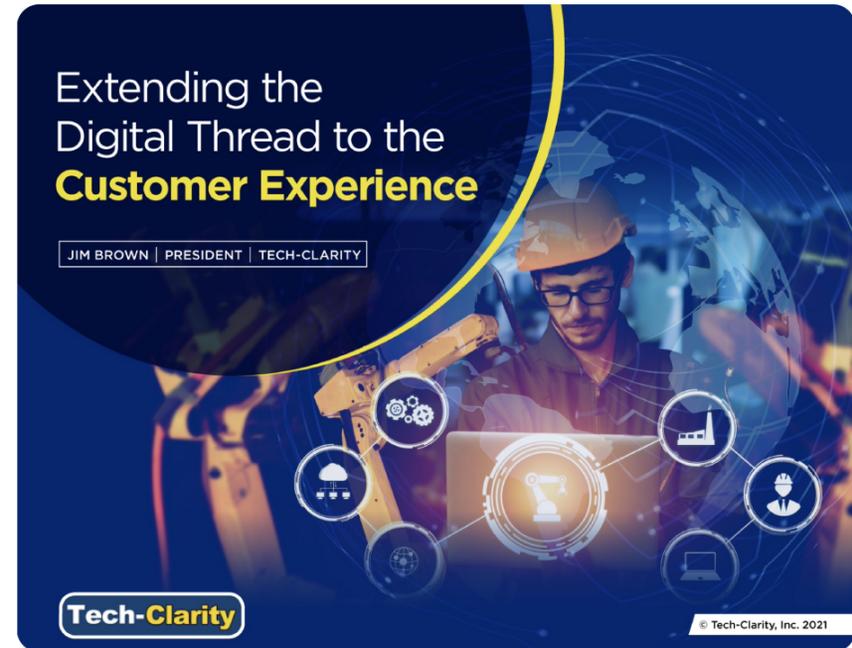


Are you able to capture the customer experience and tie it to the product lifecycle to help you make better decisions?

In this eBook, you'll take away new opportunities to unlock added value by:

- ✓ Merging the operational phase of the product lifecycle with the voice of the customer
- ✓ Closing the loop to deliver a true customer-centric product experience
- ✓ Integrating product and customer experience elements from several underlying systems



Tech-Clarity interviewed eight manufacturers to discover how digital technologies transform the customer experience to increase profitability. In this eBook, business leaders across industries share anecdotes that highlight the importance of merging the digital thread with customer experience to enable entirely new business models. Learn how keeping the customer central to everything helps companies navigate their digital transformation journey.

propel Propel's cloud-based PLM platform uniquely delivers a customer-centric product experience to help manufacturers take their products from concept to customer.

propelplm.com

Extending the Digital Thread to the **Customer Experience**

JIM BROWN | PRESIDENT | TECH-CLARITY

Tech-Clarity

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Digital Transformation Unlocks Customer Value

Digital Transformation Drives Greater Customer Intimacy and Profitability

Our research shows that 95% of companies view digital transformation as either important or critical to the long-term success of their company¹. The survey further finds the only thing more critical to a company's long-term business success than digital transformation is their customer relationships. How can digital technologies help manufacturers get closer to customers, gain more intimacy, and create more business value for their customers and themselves? We interviewed eight manufacturers to find out.

This eBook explores extending the digital thread into the operational phase of the product lifecycle – capturing the current, as is configuration of the product and how the customer actually uses it. Read on to learn how capturing the customer experience helps manufacturers gain new levels of intelligence and insight into products and customers so they can develop stronger customer relationships and drive higher levels of profitability.



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Digital Thread Context and Definition(s)

Streamlining Design and Providing Digital Continuity

Most people know the value of customer relationships but may be less familiar with the digital thread. Let's provide some context.

We define two primary views of the digital thread, streamlining design and providing traceability. Both are valuable, but we're focusing on extending the latter to the customer experience:

- **Digital Continuity** - The digital thread ties product information, decisions, and history together in a structured, integrated way that captures product innovation and knowledge throughout the product lifecycle. It establishes traceability early in the front end of innovation and extends through manufacturing, service, and field operation.

Discussions with manufacturers, however, lead to the conclusion that there are multiple definitions and little consensus on what a digital thread really is. Most are looking for a continuous view of product information from concept throughout the lifecycle, but they may be doing so for different reasons. Like any technology or initiative, it's important to set tangible business goals for the digital thread. This research focuses on using it to improve customer service and relationships.

Expanding the Value

Some may look at the digital thread as an audit trail, which provides value in many ways. Having a trusted understanding of product configurations and history can help companies improve quality, encourage reuse, simplify compliance, and more. Digital transformation unlocks new, previously unachievable business value by mining data for intelligence about product and customer experiences. The digital thread is the underlying source of this information.

“

Knowing the product history offers the ability to better support customers. The cost downtime for customers is really high. It's important to have accurate information to keep costs low and keep time to respond fast.

”

Program Manager

SEMICONDUCTOR TOOLS COMPANY

Digital Thread Maturity

Dimensions of Digital Thread Maturity

Our interviews discovered a variety of digital thread maturity levels with expanding levels of value. We found significant variation in the maturity of digital threads capabilities in:

- The **approach**, ranging from maintaining basic history in spreadsheets and text documents to more rigorous, structured data approaches
- The **scope**, starting from developing a partial picture and expanding to capture information from more disciplines
- The **lifecycle**, representing a variety of maturity that ranges from only design and engineering phases to extension to the in-use phase

We believe that digitalization opens up opportunities to improve digital thread maturity. This research focuses primarily on the value of extending the digital thread further into the product lifecycle and customer experience, although there are benefits for extending along the other dimensions as well.

Expanding Beyond Design

Most companies start with the basics, the designed product configuration. Even gathering trusted data at this level can be challenging, but it provides significant value in terms of design traceability and engineering efficiency.

Some companies go beyond the planned product configuration by capturing how items were actually produced, in some cases including specific component lot or serial numbers. This information is not always complete, however, and not everyone with this data integrates it into the digital thread. Capturing how it was built extends the value by providing greater traceability and the opportunity for continuous improvement.

Lifecycle Focus of the Digital Thread

As-Designed

The basics - tracking by configuration and revisions



As-Built

Tracking by lot or by unit, ideally including serial numbers for at least critical components



As-Maintained

Tracking updates to a product as it is upgraded, modified, and maintained, ideally incorporating mechanical, electrical, and software elements. Potentially including as-installed information in some industries.



As-Used

Tracking the interactions between the customer and the product. This level of customer and product intimacy is more a vision at this point due to high barriers of capturing and correlating disparate product and customer data but is becoming more achievable



Digital Thread Maturity

Expanding into the Operational / “As Used” Lifecycle

Extending digital thread data to how the product has been maintained furthers the value and provides insights that can help better support customers. But very few companies have accurate information at this level, even on a standalone basis. Today, most companies that manage this level of detail are safety-critical industries that do so because they are required to by customers or regulatory bodies.

Going beyond the as-maintained to include the customer experience offers untapped business opportunity by creating a wealth of digital data to improve service performance, customer relationships, and profitability. This level of customer and product intimacy is more of a vision at this point due to high barriers to capturing and correlating disparate product and customer data but is becoming more achievable through digital transformation.

“

We have relied on customers to phone and ask for a part and relied on them to know what they needed. It handcuffs us because they could only order what they knew. That will change with an up-to-date parts catalog based on a complete digital understanding of each product.

”

Mike Thomas

Technical Services Manager

PRAIRIE MACHINES

The Business Value of Extending the Digital Thread

Gain Value from the Digital Thread

Providing an audit trail has value, and for some safety-critical industries is mandated for risk management and compliance. Beyond that, our research² found that manufacturers achieve important benefits from the digital thread. But even these goals and objectives are primarily engineering and product development focused. Most companies focus internally and don't tap into the broader benefits downstream. It's important to go beyond traceability and put data into action to gain the greatest levels of value. Let's explore the value.

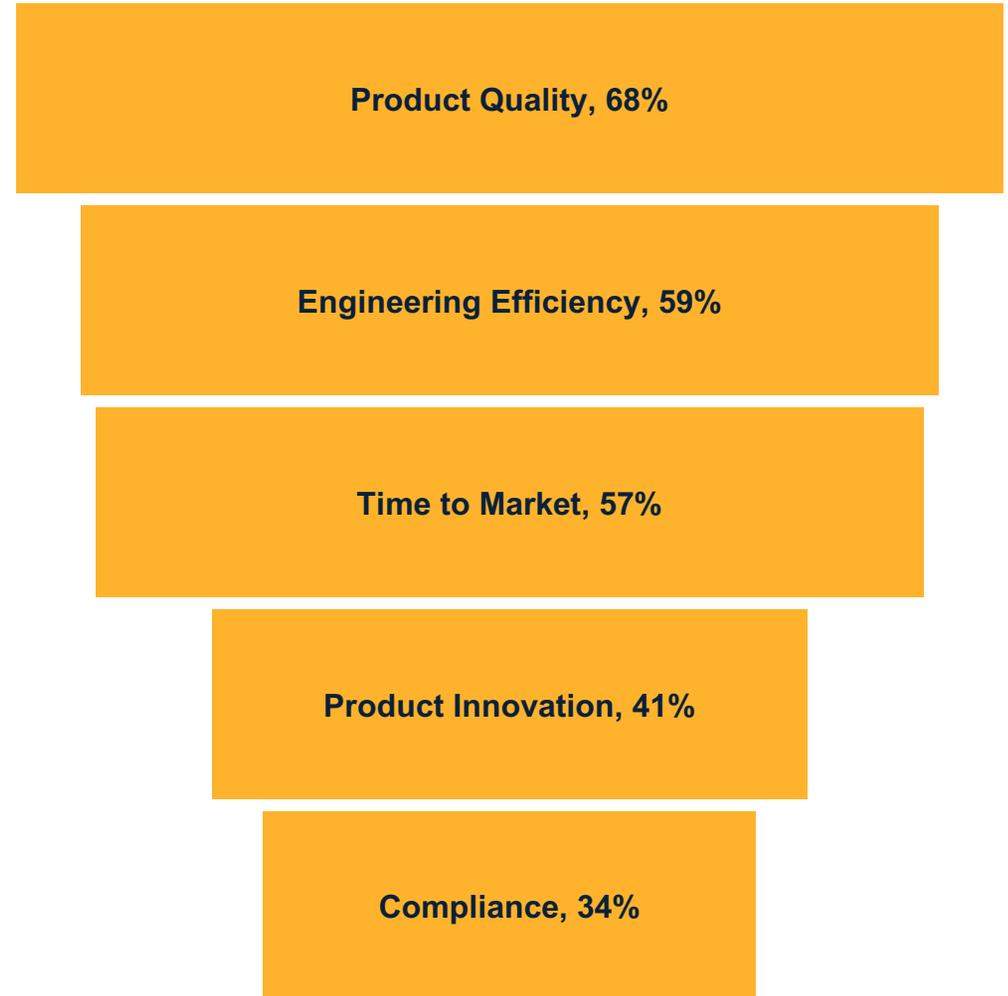
Be Easy to Do Business With

One way to extend the digital thread's value is by using it to better serve customers. Customers expect you to know your products when they need your help, but it's not always as simple as it sounds. In many cases, just having a trusted definition of the product would add additional value.

Servicing products isn't just good customer service. Service and parts revenue can be significantly more profitable than selling products in the first place. Leveraging the digital thread to provide customer self-service, for example, provides efficiency and helps capture high-margin parts business.

Allowing the customer to choose parts with confidence requires an up-to-date view of the product configuration in the field, not just the way it was originally designed.

Benefits of the Digital Thread²



The Business Value of Extending the Digital Thread

Improve Customer Support with Information

Being a good partner means realizing your customers' success is your success. Improving customer service with the digital thread helps customers get the most from your products, enhancing both your relationship and their likelihood to seek you out for upgrades and replacements.

The value of information increases significantly as it is shared with customer service representatives and service technicians. Granting access to up-to-date, trusted digital thread data helps avoid costs from return visits and improves first-time fix rates. This valuable data can even be extended to customers to allow self-service.

“ We format and prepare our manufacturing BOMs and part details for use as a service BOM for a parts catalog, it supports our strategic goal to focus on aftersales. We provide serial-number-specific catalogs for our customers so that they see their equipment exactly as it is. It improves the customer relationship because they can get more information and readily get parts.

”

Mike Thomas

Technical Services Manager

PRAIRIE MACHINES

“ The thing that will stop our customers from making money is downtime. Every minute they're shut down they're losing hundreds of dollars. Having a full 3D representation and basic history of the machine on hand helps us support our custom equipment in perpetuity. It also helps us continuously improve and learn from our mistakes to prevent issues in the first place.

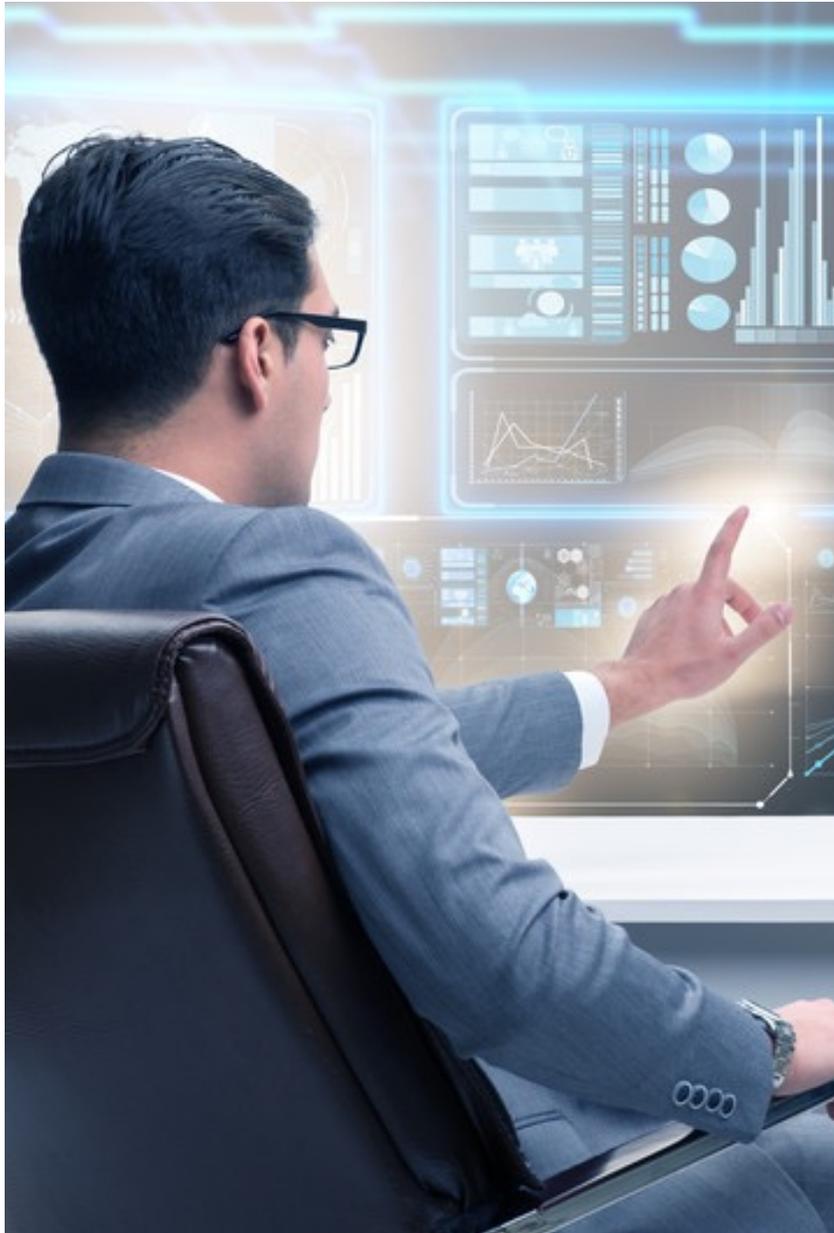
”

Calvin Carlson

Engineering Manager

ZOSKE MANUFACTURING

The Business Value of Extending the Digital Thread



Be Proactive to Drive Customer Success

More mature companies extend beyond making information visible for people to make decisions to a more proactive service approach. These techniques rely on accurate data, including extended digital thread information. Predictive methods based on digital thread data can reduce mean time between failures and can help improve customer value. In some cases, it can be offered as a value-added service to increase support revenue.

Increasing the level of product intelligence, particularly with a predictive approach, can also help uncover new opportunities. For example, companies could determine upsell or replacement opportunities based on usage patterns. Companies with a more aggressive digital transformation strategy may also use the extended digital thread to transition to a "product as a service" (PaaS) model or sell outcomes instead of products. In these scenarios, added product intelligence can help reduce costs and optimize profits.

“ Having digital product intelligence provides the ability to be proactive. Warranties are reactive, that’s old school. Success lies in being proactive. We want to know what’s going on with our products at our customers. ”

CEO and CTO

CONTRACT DESIGN AND MANUFACTURING FIRM

Merge Product Threads with Customer Experience

Improve Customer Relationships – and Revenue

The digital thread is key to becoming a digital business, gaining digital intelligence and intimacy. There is more strategic value available from it than many are currently targeting. Expanding the digital thread to not only the as-used product but the way the customer interacts with the product opens up opportunities for:

- Increasing maintenance revenue
- Decreasing maintenance / warranty costs
- Increasing revenue from spares, supplies
- Identifying new sales opportunities, such as cross-sells and add-ons
- Improving upgrade and replacement sales opportunities
- Developing more product and customer intimacy
- Driving higher customer satisfaction, advocacy, and referrals
- Closing the loop for continuous improvement

Develop Deeper Customer Insights

The more you know about the product and the customer, the better you can reduce cost and drive improvements to the top line. Knowledge of the customer experience can empower the contact center to go beyond reacting to inquiries and allow them to identify new opportunities, such as providing the data to target sales campaigns with insights about not just what products customers have but how they're actually using them.

Deeper insights into the customer experience could show that a customer is underutilizing a product and be open to buying a more competitively priced alternative with better margins. Or, they may be overutilizing it and be a candidate to step up to a more advanced, robust, higher-priced model. Either way, developing a strong customer relationship based on how they use – and gain value – from your products leads to previously unattainable opportunities.



Extending the digital thread into the operational, or “in use” lifecycle offers untapped potential to drive profits from better product and customer intimacy.

Identify Hurdles to Extending the Digital Thread



People Challenges

The value is available, but it's important to be realistic about the challenges companies face when pursuing the digital thread. Companies frequently lose the ability to track detailed product information further along the product lifecycle. Things get more complex as they move from design, to manufacturing, to installation, to the service phase. More people and organizations interact with the product. Activity moves from internal locations out into the field. It becomes harder to manage and control all of the different activities.

Changes in the field are not always visible, let alone recorded in the product context. Some updates may be made by a third-party firm or by the customers themselves. At this time, not everyone sees “what’s in it for me?” other than additional work and overhead for reporting. This is an important organizational issue to acknowledge and address so everyone is bought into the process.

“ Every country has a country manager, so I’m trying to negotiate with 30-40 organizations to get them onboard to change their process(es) with additional activities to support an as-maintained BOM. ”

Greg Yow

PLM Manager

LIFE SCIENCES

Identify Hurdles to Extending the Digital Thread



Process Challenges

The digital thread gets further away from design controls and traceability when the product leaves Engineering. Most manufacturers recognize the value of engineering change control practices, but they are often still challenging. This gets harder when the product is in the field. Too often, it becomes a people versus process-centric activity, particularly when third parties are involved. As one participant explained: companies are very reliant on service people to write down what they do.

Maintaining a complete, accurate digital thread in the field requires strong processes, effective training, motivation, and reinforcement. As we'll learn later, technology can help implement and enforce the right behavior.

“

We have standards for data capture. But if the operator is new and under training, for example the client's own technicians or operators, data can be missed.

”

Ali Nekourouh

Vice President / Engineer
BRAZEN TEK INC.

Identify Hurdles to Extending the Digital Thread



Technology Challenges

Many companies don't have the right technology to collect, manage, and put digital thread data into action. PDM and PLM are the core technologies to manage product designs and configurations. They provide a structured way to document product information and make it searchable. Unfortunately, many companies still rely on spreadsheets and text documents, or they may have 3D CAD models which are not easy to access by non-engineers.

The as-built configuration is probably in a Manufacturing Execution System (MES) and/or an ERP system, or potentially in spreadsheets, and not kept in association with the original design data. This data can be hard to correlate with the underlying design data because of differences in data structures between engineering and manufacturing BOMs.

Further from the original design data is information about the customer experience which may be split across multiple systems, including Service Lifecycle Management (SLM) and Customer Relationship Management (CRM). This data may be in a format like notes that is not easily interpreted and not detailed enough, which makes it hard to put into action. In addition, much of the information is only gained during negative events such as failures or warranty service calls and misses vital information about usage.

Overall, the data needed to extend the digital thread is frequently held in multiple silos and sometimes isn't even digital. In most cases, technology needs to be improved and integrated to achieve the digital thread's full potential value.



Disconnected systems for design, manufacturing, and service make it hard to pull together typically disparate "product" and "customer" aspects into the "customer experience."

“ We see PDM for BOMs and ERP for manufacturing / as-built BOM. We needed a third location to manage the service BOM (post-sales). We were using Excel. ”

Mike Thomas

Technical Services Manager

PRAIRIE MACHINES

Not an “All or Nothing” Proposition

One Size Doesn't Fit All

While the challenges seem daunting, the value is compelling and companies should expect that attaining the digital thread is a journey with many steps along the way. Done right, each can provide incremental value. It would be foolish to assume that every company should track every product and customer interaction. The exception may be safety-critical industries where the digital thread may be mandatory and the investment is just a cost of doing business.

For others, it's important to recognize that some data is better than none. Manufacturers can gain valuable insights even from incomplete data and should balance the cost of data collection and management with available benefits. For example, when looking at as-manufactured data, not every manufacturer has (or needs) traceability on a nested serial number basis.

Align Strategy with Business Value

Instead, they may know serial numbers or end products and lot numbers of components. Or track production by day to limit the scope of a potential recall. For them, this may be enough to make risk acceptable by supporting a where-used search that limits their exposure.

In the same way, companies can identify which customer experience details will provide the right foundation to develop the insights and intimacy they need to drive value for their company. It's not necessarily important to follow the product lifecycle when deciding where to start. For some companies, it may make sense to start by capturing customer interactions and service details versus improving manufacturing data capture to increase customer retention and spend. The important thing is to find what drives value.

“

I've seen how PLM is used for aerospace companies. We'll never get to that level. It's very expensive and we don't have their safety issues.

”

Greg Yow

PLM Manager

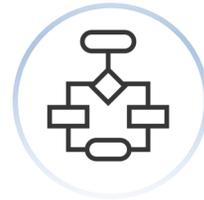
LIFE SCIENCES

Reduce the Barriers



People

Now that you understand the potential, how can your company overcome the challenges and drive value? Organizational changes can help. For example, educating employees that “the data is the job” can help by showing them why their actions add value downstream, or potentially “gamifying” customer data capture. Some companies employ incentives, particularly with partners or customers where it is more difficult to mandate requirements.



Process

Developing the right processes that incorporate data capture is critical. Business processes that touch the product and the customer relationship should have clearly defined data quality ownership. Adding controls like not being able to close a service ticket with incomplete data can also help.

“

We encourage customers to let us know how they’re using our products and if they’ve made changes. We like to be really engaged. We’ll even pay them for letting us know things by giving them a gift card!

CEO and CTO

CONTRACT DESIGN AND MANUFACTURING FIRM

“

When I worked in the medical device industry, capturing data was already built into our device history process.

”

Greg Yow

PLM Manager

LIFE SCIENCES

Reduce the Barriers



Technology – Data Capture

The right organizational approach and good processes should be supported with the right technical enablers. Technology lowers the investment and overhead required to gather digital thread data, making it feasible for smaller companies and more industries.

Data capture is the starting point. Automated data gathering can make data collection easier for employees. Creating technology that captures information as work is completed is much more likely to be adhered to than expecting people to document it after the fact.

“ People don’t want to track things. They may get lazy or be more worried about productivity. We try to make it easy. They just have to scan and RFID / barcode. We have PC’s in every work cell. We have more PCs than people! Even our shipping people can input and read notes about customers. ”

CEO and CTO

CONTRACT DESIGN AND MANUFACTURING FIRM



Reduce the Barriers



Technology – Data Integration

Once collected, digital thread data needs to be kept in a structured format that maintains data relationships and is easily extended. PLM solutions can play a key role in supporting and extending the digital thread.

But most PLM implementations focus internally and don't directly create all of the information needed for the extended digital thread.

No single system has all of the data. While the PLM might be the authoring environment for the as-designed BOM, the as-built is likely in an ERP or MES system. Service and customer experience-related information might include SLM for service orders, trouble tickets, and parts and/or CRM for customer data and complaints.

The power of the digital thread comes from integrating this information and keeping it in context. Only by combining the data from these different systems can you gain the full picture of the product and customer experience.

“ Engineering and manufacturing enter product data into different parts of the same system. We store whatever they do in a database, track it by product and serial number, and link it in different ways. ”

Ali Nekourouh

Vice President / Engineer

BRAZEN TEK INC.

Reduce the Barriers



Technology – Platform

What would an ideal digital thread platform look like? We believe that PLM is the clear backbone on which the rest of the information can be added, either directly or through association.

PLM provides the product context, manages revisions, and maintains relationships. But it takes more than PLM. An ideal platform would also incorporate manufacturing, service, and customer data and tie it all together.

Most companies will have to assemble these solutions manually. We expect, however, to see Product Innovation Platforms continue to expand to broader aspects of the product lifecycle and the digital thread.

Beyond PLM, ERP, SLM, and CRM, the ideal platform would also incorporate IoT data to directly update the digital thread in real-time and offer a data lake for analytics to leverage the underlying data. A holistic, digital platform has the potential to increase maturity and drive new value from the digital thread to the customer experience at an attainable investment of time and money.

“ We are working on a new system – a newer generation platform. In the new way, we will have more digital information on the cloud. ”

Program Manager
SEMICONDUCTOR TOOLS COMPANY

“ Tracking things is the most fundamental step. Everything goes into the data warehouse. The key thing is not just storing it, but connecting it. ”

CEO and CTO
CONTRACT DESIGN AND MANUFACTURING FIRM

Conclusion

“ We really like our PDM system, our engineers use it all the time. We manage change orders, approvals, and lifecycles to keep product information up to date – it’s working quite well. ”

Mike Thomas

Technical Services Manager

PRAIRIE MACHINES

“ We use our PLM system for managing products in design; it is a good system for managing products over its lifecycle and we manage our BOMs in ERP. We have a clear, defined engineering change management process to track anytime we change a part, change of material, etc. It’s a very structured approach with PLM. It makes things much easier. ”

Manager

CONSUMER APPLIANCES COMPANY

Findings

Times are changing. Digital transformation demands more of the digital thread but also provides the capabilities needed to gather and maintain the information it demands. Today, however, there are widely varying levels of maturity across the manufacturing industry. Although it's a journey, we believe that developing a high-quality, complete, digital thread will help manufacturers improve quality, engineering efficiency, time to market, innovation, and compliance.

Putting the Digital Thread in Place with PLM

The digital thread starts with design history and audit trail but extends beyond that and includes manufacturing and service data. But beyond just capturing disparate pieces of information, manufacturers have to integrate it into the digital thread context.

PLM is that foundation. It provides data management and does so in the context of data relationships and the product lifecycle.

Next Steps

Extend the Digital Thread

Extend the digital thread to the customer experience to achieve even greater value:

- Develop a more intimate understanding of the customer and product experience.
- Create new value from increasing profitability with lower costs and higher revenue from spares, suppliers, upgrades, replacements, and cross-selling opportunities.
- Unlock new potential by closing the loop for continuous improvement.

Achieve the Vision

The value is available, and each company should decide how best to take advantage of it. In the process, they will need to consider organizational elements like incentives, training, and developing buy-in. They should adopt best practice processes that incorporate data collection and install a sense of data quality ownership. Lastly, they should look to create a platform of solutions that integrates all of the product and customer experience elements together from underlying systems, including; PLM, ERP, MES, SLM, and CRM. The vision is achievable and starts with a strategy that can be implemented over time to drive new value.

“ Information is power in manufacturing. The more you know about what goes into your product, where it is, and about the consumer, the better you are. ”

CEO and CTO

CONTRACT DESIGN AND MANUFACTURING FIRM

“ If field service wants to order spare parts, wouldn't it be easy if they could go into PLM, find the spare part from the BOM, then create the order in Salesforce and pass it to ERP? That would be cool! ”

Greg Yow

PLM Manager

LIFE SCIENCES

Acknowledgments



Jim Brown
President
Tech-Clarity, Inc.

About the Author

Jim Brown founded Tech-Clarity in 2002 and has over 30 years of experience in the manufacturing and software industries. Jim is an experienced researcher, author, and speaker and enjoys engaging with people with a passion to improve business performance through digital enterprise strategies and supporting software technology.

Jim is actively researching the impact of digital transformation and technology convergence in the manufacturing industries.



Tech-Clarity is an independent research firm dedicated to making the business value of technology clear. We analyze how companies improve innovation, product development, design, engineering, manufacturing, and service performance through the use of digital transformation, best practices, software technology, industrial automation, and IT services.

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