# Fragmented PLM Technologies Present Investors with Opportunity to Consolidate Across the Digital Thread

There are huge quantities of disparate data generated and managed from each stage of the product lifecycle—from design to development. With this level of available data, manufacturers are seeing the potential to enhance operational efficiency by improving end-to-end visibility. Consolidated and complete data pays dividends, such as informing decisions about demand, pricing, promotion and whether a company should expand or cut costs.[1] As global events, including the ongoing pandemic, impact manufacturing worldwide, the end-to-end visibility will become even more integral to the product lifecycle.

While some of these technologies have been around for more than 20 years, it's only now that companies are finally putting the puzzle pieces together to paint the full picture.

Herein lies the opportunity for investors: begin to create a digital thread—knitting together interoperability of various technology solutions through M&A, collecting complete data and building an integrated view of all aspects of a product throughout its lifecycle.

## Key themes driving industry consolidation:

There is an opportunity to build a comprehensive solution that connects the various product development and lifecycle management technologies, with broad end-market applicability and enhanced appeal and usability for the end-users, including the next generation of business users.

An add-on acquisition strategy can bring significant additional value, allowing tech players to distinguish from the competition and gain wallet share among customers.

Providing deeply technical, cutting-edge solutions across the product lifecycle will allow designers, manufacturers and distributors to develop, build and support superior products.

## Learn more about the opportunities for investors below:

### 1 Design & Rapid Prototyping

Today there is a push toward offering sophisticated, comprehensive software to allow for the development of better, safer and more reliable products while reducing, or even eliminating, the need for costly physical testing and prototyping. As such, design is an integral early step in the product lifecycle.

To reach that goal, organizations rely on design and prototyping software, such as Computer Aided Design (CAD), software to visualize a product idea, as well as Computer Aided Engineering (CAE) software, which is the use of technology to accurately model performance to improve product designs. Others include multi-physics solvers, which help simulate design and predict real-life reliability and functionality; digital twins, a digital replica of a physical product throughout its lifecycle; and decision analytics, which provide data-backed insights to inform the supply chain. These examples of software and advanced technology are presenting investors with opportunities for success.

**Consolidation benefits**

- Reduced product development cost and time
- Performance insights in the development process, when it is less expensive to make changes
- Improved product quality and durability
- Risk management and better understanding of performance implications
- Refined designs with computer simulations rather than physical prototype testing
- Earlier problem resolution—reducing associated costs

**How rapid prototyping is transforming manufacturing**

Product example: the design of a dishwasher has progressed greatly from the time of the first patent around 1850, when they were large contraptions that soaked and rotated dishes. Today, consumers demand much more from their home appliances, such as quiet cleaning as a key product feature. As such, manufacturers have leveraged rapid prototyping to design dishwashers quieter than ever before—reaching around 40 decibel units (dBA), or the equivalent of a bird call or the noise generated in a library.

### 2 Product Realization

Following the design stage, organizations move to manufacture the product. This typically includes:

- **Bill of Materials (BOM) management:** organizing the materials that make up the product
- **Quality management:** ensuring quality by collecting defects and establishing patterns
- **Inventory management:** the components and raw materials needed to build a product while also creating enough product to satisfy demand, without overstocking
- **Design collaboration:** the ability for various stakeholders on a product team to have visibility and input across the product design phase
- **Manufacturing integration:** transformation of raw goods into the final product
- **Test management:** software to manage tests and procedures

**Software becomes invaluable to manufacturing**

Organizations need a single place to aggregate product information and related processes as there is a significant amount of data and information associated with design and production—from electrical to mechanical, software and hardware.

Software accelerates the engineering process, automates review and tailors to team's specific needs. Additionally, the BOM is easily shared with the entire supply chain to ensure everyone is working with the latest information.

Solutions that work together to aggregate data and create a singular view of the product include PLM software, enterprise resource planning, quality management, artificial intelligence, manufacturing execution systems, Master Data Management (MDM), Product Information Management (PIM) and Data Asset Management (DAM).

**Consolidation benefits**

- Reduced risk
- Better data sharing
- Improved cost management
- Accelerated time to market
- Increased ability to scale
- Better quality products and increased innovation
- Strengthened customer loyalty
- Centralized information
- Increased productivity
- Increased revenue

**To grow, software companies often turn to M&A**

Leaders in this space tend to have extensive and innovative product design and lifecycle management technologies, which are often the result of working with some of the world's leading companies with the most complex design challenges. To expand on these capabilities, software providers are often partnering or acquiring companies to extend their capabilities and build a broader solution. Doing so helps them not only achieve that goal, but also differentiate from the competition.[2]

**How production software helps companies ensure quality**

Product example: today's dishwashers are comprised of many parts—from the filtration system to the detergent and rinse aid dispensers as well as the spray arms, motors, pumps and hoses. BOM and inventory software ensure that each piece is added to the product on the factory floor.

Combined with test management and quality management software, product designers can be confident that the finished dishwasher will function properly in consumers' homes.

### 3 Distribution & Usage

The distribution and usage of the product is a critical component of the product lifecycle. Data sets at the distribution stage signal when sellers need to restock shelves or, alternatively, slow down production. In addition, both B2B and B2C companies use technology solutions at this stage of the product lifecycle as a tool to differentiate themselves—especially in competitive markets and for products that require shopping experiences with a high degree of personalization.

As such, manufacturers are turning to technologies like MDM, PIM and DAM, often offering all three of these solutions on a common platform. These technologies make it easier for organizations to collect, organize and disseminate product information to manufacturers, distributors, retailers and, ultimately, customers and end-users. The technologies enable information to be accessed across channels (online, mobile, in-store), in a variety of languages and customized for the local consumer.

**MDM, PIM and DAM solutions deliver high ROI**

MDM, PIM and DAM allow companies to develop relevant, highly-analytical business insights—driving increased revenue and improving customer experience.

**Benefits of the solutions:**

- Ensured data accuracy and integrity by unifying disparate data sources and running checks for duplicate entries and errors
- Information compiled into one platform that can be deployed throughout the entire organization
- Stored and managed data to meet every government and industry regulation without manual oversight
- Connection of the entire retail ecosystem—including product data, digital assets and external partners

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**Industry trends driving growth**

Product information management and data management solution providers will flourish thanks to strong industry and secular tailwinds.

**Key trends driving growth:**

- Increased complexity of managing and unifying an organization's data sets
- Heightened consumer demand for cutting-edge shopping experiences
- Motivation to improve operations by leveraging invaluable master data
- Ensured compliance with government and industry-mandated regulations
- Need for a unified omnichannel retail experience with product information available across the digital shelf
- Brands that sell across borders have the complex challenge of localizing data for individual markets
- Informed consumers desire to filter product options by features, materials, ingredients, etc.

**How distribution software informs customers and inventory forecasting**

Product example: When consumers turn to retailers or e-commerce sites to research the best new dishwashers, technologies like MDM, PIM and DAM enable them to have all relevant information at their fingertips. From the size of the appliance to the finish and soundproofing technology, consumers want to know product details beyond the cost. Software makes it easier to capture and distribute this information.

## Lincoln Perspective:

The industry was traditionally fragmented, consisting of specific point solutions oriented towards specialized mathematical and physics problems related to design, validation, engineering, manufacturing and eventually distribution. But today, consolidation is working towards the goal of providing manufacturers with a singular source of truth through the creation of an end-to-end solution.

The call of building a comprehensive digital thread is driving opportunities for M&A for software companies, private equity players and strategics alike:

**For software companies:**

As technology valuations reach all-time highs, technology companies looking to sell will find ripe opportunities for attractive bids. Interoperability and seamless integration with other software offerings to build a digital thread makes these acquisition targets more attractive. With more dry powder on the sidelines, private equity acquirers are on the hunt for high quality targets; we also see a select group of blue-chip strategic acquirers in the space with a long track-record of consolidating various functionality and technological capabilities across the product lifecycle management spectrum.

**For private equity investors:**

While consolidation has already begun in order for manufacturing companies to gain access to data about their products from cradle to grave, we are still in the early stages. PE firms are in the unique position to invest in companies that provide this greater data visibility throughout the product lifecycle to manufacturing clients, which are willing to pay a premium for a more holistic end-to-end solution. For this reason, buy and build strategies will be adopted to construct more robust—and attractive—technology solutions for clients. As smaller players continue to emerge, there will be no shortage of attractive targets. Due to the Industry 4.0 transformation underway, strategic buyers are available for when the time is right to exit.

**For manufacturing companies:**

Technology has been increasingly leveraged throughout manufacturing and the product lifecycle following the global pandemic, making the tech solutions needed to build a digital thread even more attractive to investors. Additionally, as indicated in our earlier Industry 4.0 perspective by our colleague Tobias Ramminger, "Bigger companies will incubate these technologies in-house somehow, either through acquisition or by building new capabilities over time. Siemens, for example, has been continuously acquiring software companies to offer comprehensive solutions for customers and continuous support along the entire value chain. Other corporates are following suit."

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[1] Investopedia
[2] CIM Data