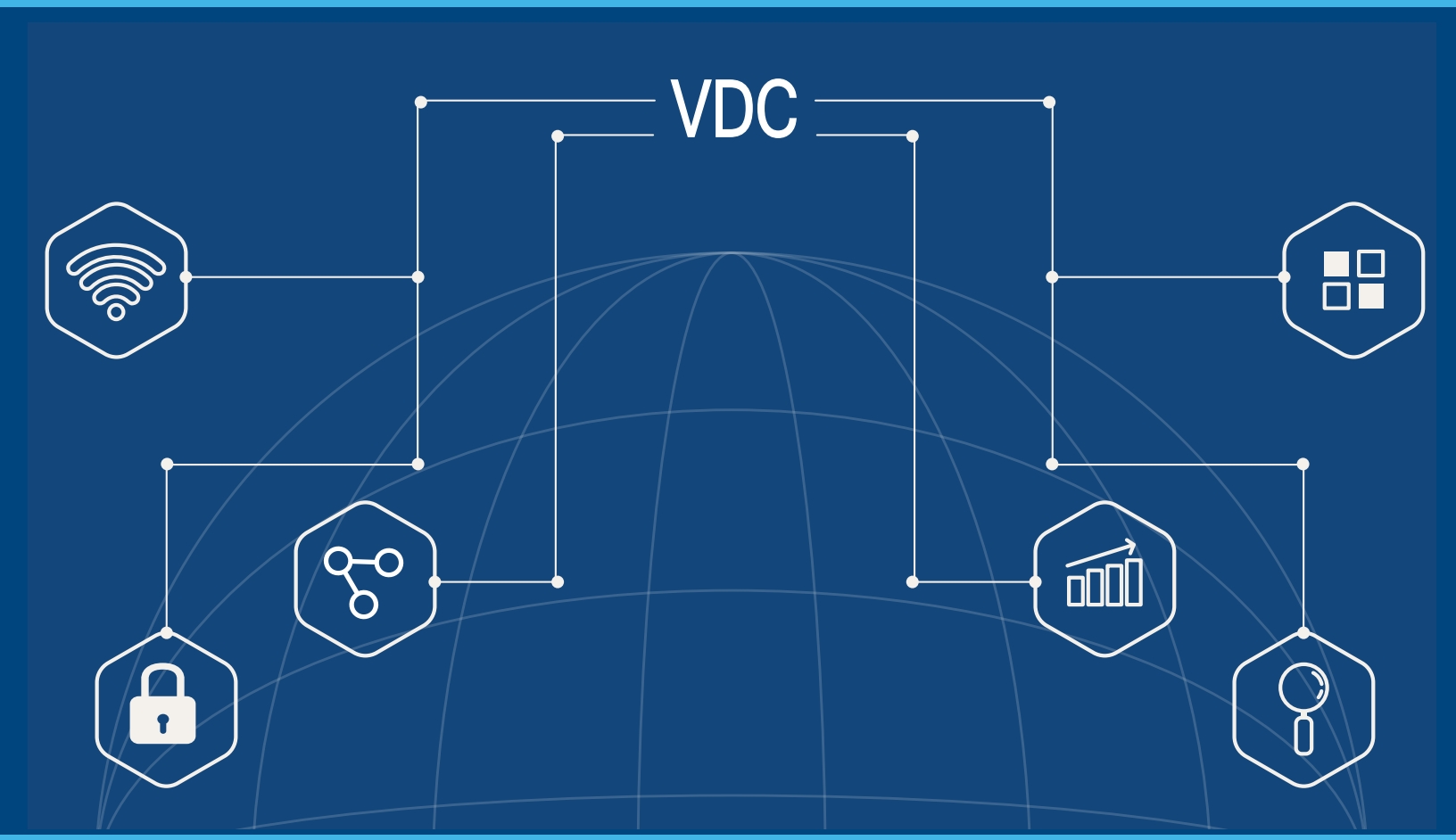
Barcode Labeling Accuracy Takes Center Stage

Dynamic Data Printing Holds the Key to Error-Free Labeling



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VDC Research

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Enterprise Labeling Investments and Key Considerations

Barcode labeling has evolved from a standalone, purpose-built application to one that is now tightly integrated with key enterprise systems to promote data consistency, reliability, and synchronicity across globally distributed operating environments. Stringent compliance mandates laid out by global regulatory bodies have stretched the capabilities of standalone labeling applications, thereby increasing the possibility of errors. Labeling is now mission-critical to organizations' overall supply chain management and traceability initiatives, especially to lower error incidence and adequately address the need for dynamic content creation, in turn giving rise to a greater emphasis on labeling automation with certified integration to sources of truth for data. This helps organizations streamline labeling processes and reduce operational hiccups. COVID's effect on Enterprise Labeling is also here to stay. Requirements for greater visibility into operations and product distribution is higher than ever before even as organizations, for instance, deal with an accelerated growth in e-commerce volumes putting significant pressures on their supply chains and traceability-related efforts.

The exposure to the possibility of labeling errors is only increasing as evidenced by VDC's recently conducted survey among 150 large, North American enterprises to better understand their barcode labeling investments and considerations. Eight in ten large enterprises claim to experience at least one major labeling error per year, costing them upwards of $2M. These costs are driven by reasons including—scrapping the entire production batch affected by inaccurate labeling, regulatory penalties and fines for non-compliance, costly product recalls/restocking, entry of counterfeit products in the supply chain, and rendering the product unavailable during restocking. This makes it imperative to ensure that the right data/label gets on the right product at the right time. There is also a growing need to access and use variable data for labeling, especially in facilities managing high volumes of labeling and when there's mounting labeling complexity. Data-driven labeling enables users to print uniquely identifiable information without having to create individual templates for each product. Labeling platforms can no longer function as siloed, standalone applications that do not communicate with others, as that would only serve to increase the risk of labeling errors. Instead, labeling systems need to talk to enterprise applications to work effectively and address aspects including customer demands, compliance, design and packaging, and supply chain and material handling.

Manufacturers and their distribution partners often point to labeling errors as being responsible for the high costs associated with excess inventory and massive recalls. VDC's primary research shows that a large volume of labels printed for applications like packaging, restocking, and shipping have a requirement for accurate variable information. Seventy-five percent of organizations participating in our survey indicated the need to leverage automated label data population capabilities via some level of integration with enterprise applications. This highlights the importance of access to dynamic content (whether customer, regional, or regulatory) in order to keep pace with mass label changes and increasing labeling volumes. Automated barcode labeling is becoming central to organizations' efforts to lower, if not eliminate, error incidence and regulatory violations, all while helping them ensure compliance. Based on several customer conversations, VDC sees Loftware's market positioning as a tightly integrated solution platform designed to help customers of all sizes address complex labeling and regulatory requirements with automated data flow to support error-free traceability.

COVID Impact on Labeling is Here to Stay

The COVID-19 pandemic accelerated organizations' IT infrastructure investments and increased their dependence on logistics and supply chain operations. The need for flexibility, scalability, and even versatility in handling labeling remotely across globally distributed production sites and partner/supplier locations is greater than before; all participants have felt the need to be in-sync in order to mitigate supply chain disruptions since March 2020. Seamless integration with enterprise applications including ERP, MES, and WMS is now essential to ensure data consistency and integrity. Sharp rise in e-commerce volumes and the flexibility/agility required by retailers, brand owners, and their logistics partners to support the dramatic shift in shopping habits and fulfillment options, has also impacted their digital implementation strategies as these brought to light issues with cost of labeling errors and data inconsistencies. VDC expects automation investments to ramp up significantly in order to support these tremendously high volumes. The need for labeling accuracy and real-time visibility into the movement of goods has never been higher even as costs are

being more closely scrutinized than ever before. Our primary research shows that it is now becoming critical to meet traceability requirements autonomously, especially as organizations trim their headcounts and are forced to do more with less. Modern, tightly integrated labeling solutions will be critical enablers given how it all starts with the ability to accurately identify items. Migration to cloud-based architectures has been a common theme with application investments like ERP and WMS; VDC sees similar cloud adoption patterns for label management software. Leading solution providers are already seeing an accelerated shift to cloud-based deployments, labeling automation, and tighter integration with enterprise applications.

Cloud–Labeling Anywhere. Anytime.

> VDC believes the global pandemic has made organizations evaluate automated information flow and the move to cloud from a fresh AND urgent perspective—likely driving adoption at a higher rate than previously reported.

Leading labeling solution providers are making strategic investments in building cloud-based solutions. Businesses of all sizes are recognizing the potential value and are moving from on-premise to cloud-based deployments to take advantage of benefits like freed-up storage and processing-related resources; trimmed down in-house IT functions; data consistency across globally distributed locations; and, enhanced security. VDC's research shows that this shift to cloud-based deployment has accelerated in recent times particularly because of the sheer volume of large organizations' labeling operations, running into millions of labels printed per day across thousands of printers; and, growing requirements for unhindered access across distributed locations. Labeling solution providers are also following the lead offered by enterprise application vendors when it comes to deployment models and migration to the cloud. Cloud-based platform implementation is significantly quicker than traditional deployment models and eliminates the need for ongoing maintenance and software updates. It also frees up processing-related resources and enables interoperability across supply chain participants as they all implement standardized datasets and adhere to global standards like those laid out by GS1.

VDC believes the COVID pandemic accelerated the trend to more substantial cloud-based deployments for labeling solutions and has driven tremendous need for tightly integrated and interoperable systems. Automated information flow and label data population are now critical for business continuity and promoting location-agnostic data integrity. Labeling solution providers have witnessed heightened interest in and awareness around automated information flow, especially as it relates to labeling, during (and after) this global pandemic. While enterprise applications continue to be leveraged as a "single source of truth," their built-in labeling capabilities are typically inflexible, require significant IT oversight, and are not designed to accommodate constant labeling changes. Organizations are instead choosing to focus their investments on centralized and standardized purpose-built solutions that are designed to handle labeling complexities, varied integration requirements that change by location, and distributed setups.

Global Regulatory Compliance and Support Crucial to Organizations' Growth Plans

Given the globally distributed nature of manufacturing and supply chain operations, regulatory authorities now demand greater levels of data accuracy, consistency, and synchronization in labeling regardless of geographical location. Organizations in industries such as automotive, food & beverage, pharmaceuticals, and medical devices are actively making investments in solutions that can help them protect their customers and products, through applications like data aggregation and integration, unique identification, track-and-trace, and validation/verification. They are implementing serialization processes and integrating GS1 standards into their labeling systems/operations to enable end-to-end supply chain data transparency and visibility, and to maintain compliance with regulatory requirements. Serialization requirements laid out by regulatory bodies under the Automotive Industry Action Group (AIAG), Drug Supply Chain Security Act (DSCSA), European Union Medical Device Regulation (EU MDR), and the Food Safety Modernization Act (FSMA), among others, affect manufacturers, packagers, distributors, and 3PL partners. Governing bodies like the FDA in the US and related bodies in the EU and UK all announced temporary flexibility to their labeling requirements during the COVID-19 pandemic in 2020, due to production and distribution setbacks.

The top three motivators for survey participants with existing traceability-related implementations were end-to-end supply chain data transparency and visibility; revenue growth due to improved sales forecasting; and the need to maintain compliance with regulatory requirements as laid out by global standards bodies. There are several updates happening to globally accepted standards in order to promote unimpeded visibility. In the life sciences vertical, for instance, EU MDR has replaced the existing Medical Device Directive, and is effective as of May 26, 2021, with the requirement to be fully MDR-compliant by May 2024; this was previously scheduled for May 2020 but delayed due to the pandemic. The new set of regulations includes stricter monitoring of manufacturers, new UDI marking requirements for medical devices and packaging, and EUDAMED registration. This will require organizations to change labeling processes to remain compliant and, also support content translation in up to 24 languages of the EU. In the US, the DSCSA underscores the importance of building an electronic system by leveraging labeling data to accurately trace prescription medication throughout the supply chain. This important regulation enables the FDA to protect consumers from exposure to drugs that may be contaminated, counterfeit, or even stolen.

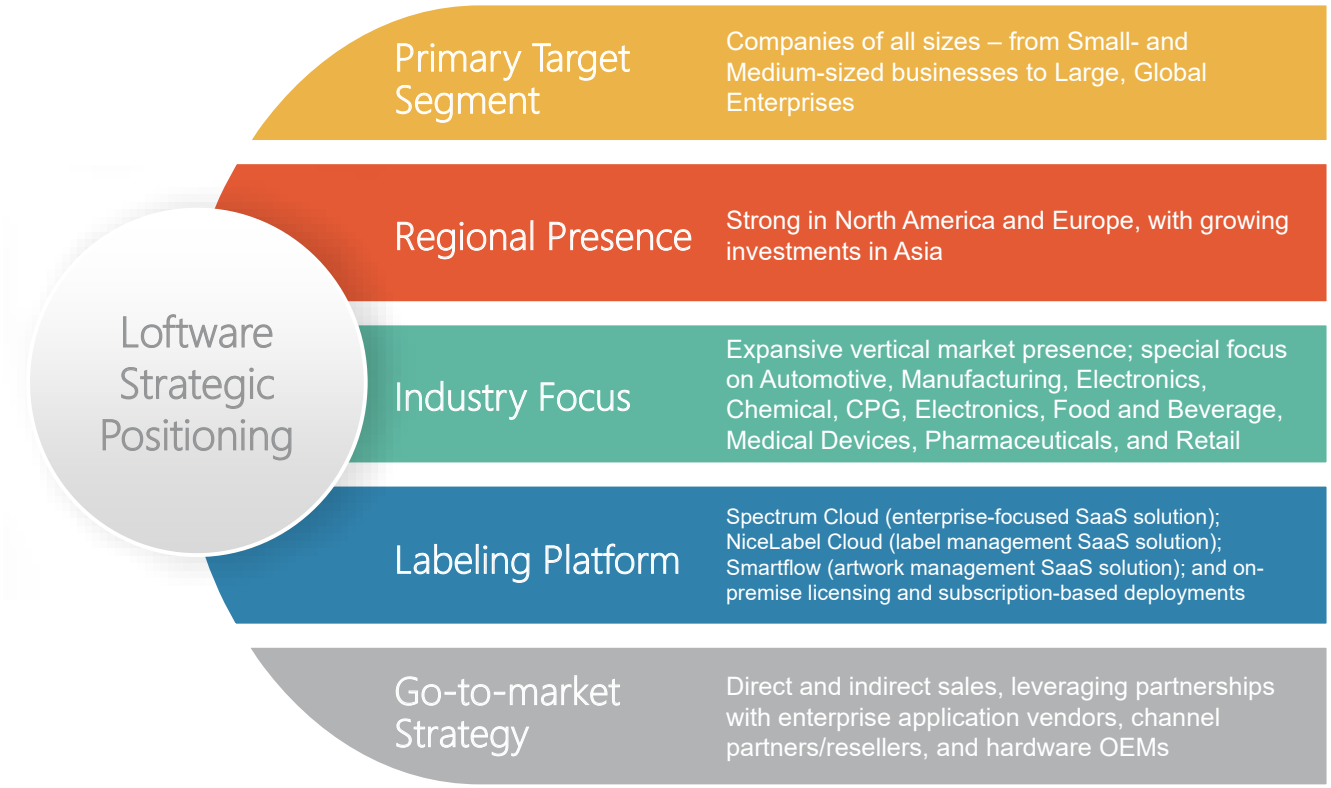
The potential for mislabeling and errors can increase if organizations continue to rely on static databases and paper-based information dockets that are challenging to edit, manage, and update. It is becoming increasingly imperative to invest in solutions that provide (controlled) access to variable data, enabling them to print variable information such as lot number, batch number, expiry date, addresses, locations, language translations, without having to create individual templates for each product (including raw material and parts).

Loftware Leads the Enterprise Labeling Conversation. Now Combined with NiceLabel.

Loftware is the Enterprise Labeling market leader, continually innovating and growing its solutions portfolio to now focus on the latest generation of Loftware Spectrum Cloud and Loftware NiceLabel Cloud (through its combination with NiceLabel). With this “combination,” Loftware has further consolidated its leadership position in the Enterprise Labeling market, offering compelling synergies from the standpoint of geographic footprint, target customer base and go-to-market model. VDC considers both brands to be committed to fostering strategic relationships with enterprise application vendors while taking a cloud-first approach to labeling solution deployment for customers and partners — via Spectrum Cloud and NiceLabel Cloud. The combined organization also offers a comprehensive, fully integrated labeling platform that is available in various deployment models—from on-prem to cloud-based—depending on preferences. Loftware has seen a significant uptick in demand for subscription-based cloud deployments (SaaS model) that are delivered by cloud service providers (AWS and Azure). Its configurable and automated Smartflow Artwork Management solution aims to reduce errors, improve regulatory compliance, and shorten the product launch cycle and time-to-market. Meanwhile, Loftware relies on partners and resellers to sell its cloud-based labeling platform, NiceLabel Cloud, having simplified labeling solution deployment and integration to support partners in their sales efforts and cut down the overall time required for installation and setup. VDC’s primary research shows that Loftware offers its customers labeling solutions that are tightly integrated with enterprise applications in order to automate data flow and promote the value of data consistency/integrity. The company is also actively promoting the notion of supplier labeling to encourage its user base to extend company-specific labeling standards—including template, format, and data validation capabilities—to their global network(s). We believe automated information flow like that leveraged by Loftware’s labeling platform(s), with controls in place to monitor access and use, will hold the key to error-free product traceability and visibility.

Cloud-based solutions like Spectrum Cloud and NiceLabel Cloud will be instrumental to enabling a flexible, modular, and scalable approach to enterprise application deployment across organizations of all sizes. VDC’s conversations with some of Loftware’s key customers highlight the ability of these solutions to offer role-based access control and permissions capabilities in order to promote increased collaboration. A significant majority of Loftware’s new customers today are choosing cloud-based, SaaS deployments (over on-prem installations) because of the overall flexibility, low maintenance requirements, speed of deployment in new locations, and ease of access/implementation. Organizations also appreciate the financial predictability of such an investment along with automatic, over-the-air software updates that ensure data/version consistency across distributed locations.

The ability to dynamically edit/update variable data on labels over-the-air—including GTIN, serial numbers, lot and batch numbers, and address data for dispatch/shipping—is critical to helping organizations dramatically lower costs, risks, and time-to-market, while also helping them adhere to complex compliance regulations. Loftware encourages active collaboration and participation from its customers to share evolving requirements and best practices for Enterprise Labeling and artwork management. There is an obvious focus on the life sciences industry, since it has requirements that are especially complex from the standpoint of labeling regulations, validations, and verifications. Loftware's Life Sciences SIG (Special Interest Group) helps the company extend its place as a thought leader in the labeling industry, committed to offering a solution suite that addresses its customers' complex labeling requirements.



Over the past four years, the company has also strategically expanded the core business—via its inclusion of artwork management as part of its portfolio in 2018, and its recent combination with leading European-based labeling solutions provider, NiceLabel. The new combined Loftware is now the largest labeling solutions provider—by number of employees, revenues, and even business reach—with a strong global footprint, well-rounded product portfolio targeting SMBs to large enterprises, and expansive vertical market presence. VDC believes that the long-term outlook and growth prospects for this combined entity look strong. The market will continue to offer up significant opportunities as organizations look to eliminate paper-based/manual processes and lower labeling error incidence; our primary research has shined the spotlight on strategic investments towards tighter integration between enterprise application systems, particularly ERP and PLM, and labeling middleware to help address dynamic label content requirements across manufacturing, warehousing, and distribution.

Loftware has maintained strategic relationships with enterprise application vendors and is built to integrate with any master data source—ERP, PLM, WMS, or serialization engines. Spectrum Cloud and NiceLabel Cloud have pre-built, certified integrations to enterprise applications including SAP and Oracle, as well as web services to integrate with any external application. The solutions are designed to alleviate the challenges associated with distributed operations, labeling scalability, and centralized application deployment models. The company offers end-to-end software development and deployment, integration, support, and services, which are unique to this market. Loftware has customers leveraging a single platform for labeling and artwork management—including label creation, approval, versioning, printing, and packaging artwork. VDC expects Loftware to shape its post-pandemic narrative with configurable, customizable, and differentiated solution capabilities that drive data consistency, offer flexibility/scalability, and enable strict adherence to regulatory compliance requirements.

Customer Case Studies

Company Overview

Perrigo Company plc is a leading provider of Quality, Affordable Self-Care Products and over-the-counter (OTC) health and wellness solutions that enhance individual well-being by empowering consumers to proactively prevent or treat conditions that can be self-managed. Led by its consumer self-care strategy, Perrigo is the largest store brand OTC player in the U.S. in the categories in which it competes through more than 9,000 SKUs under customer 'own brand' labels. Additionally, Perrigo is a Top 10 OTC company by revenue in Europe, where it markets more than 200 branded OTC products throughout 28 countries. Perrigo leverages SAP's enterprise application suite and has strategic investments in a large portfolio of non-SAP applications (integrated or standalone), deployed at a global, regional, or even local level.

Perrigo's Case Labeling History

Perrigo had a history of using several different case labeling solutions, including a legacy custom solution, across its global landscape. This variability had a profound impact on its data consistency, data integrity and reliability, labeling quality, and process efficiency. This approach also resulted in an overly complex label development process that could only be handled by highly trained personnel in the IT department. It was important for Perrigo to standardize the entire case labeling process and have a "single source for all the labeling information," which was also able to fully integrate with its SAP systems/modules. The Company was at risk of losing money if "the production line is otherwise ready but cannot print case labels for shipping." Perrigo has customers and company facilities all over the world, which made multi-language support critical for labeling. There is also a broad base of individuals and/or teams, both internal and external, that access these labels.

Relationship with Loftware

Perrigo chose Loftware for its demonstrated capabilities in addressing pharmaceutical labeling requirements and global solution, which could then be deployed and used across multiple countries. It was critical to invest in a long-term solution that could integrate seamlessly with SAP systems and also be managed centrally by sales teams that speak directly to customers and have the best understanding of their unique labeling requirements.

Perrigo primarily leverages Loftware for its case labeling initiatives. These labels tie directly back to production and every case must have accurate labels in order to ship, which makes error-free labeling initiatives critical to operations. Standardization is a crucial factor for an organization as globally diversified as Perrigo, and even more so for labeling. The Company's investments in Loftware Spectrum help it adhere to government regulations and standards worldwide for case labels, which are critical for maintaining region/country-specific compliance related to inbound shipments.

Perrigo also needs to adhere to customer-specific requirements for branding and distribution/shipping that makes dynamic labeling content access and use important. While the Company makes an effort to have all its customers (wholesalers or retailers) follow a standard labeling template, there are instances where unique, real-time adjustments to case labeling content are required based on large distribution and reselling partners' custom guidelines. Perrigo is now able to easily handle these types of exceptions, with minimal time-to-impact, which helps strengthen our customer relationships.

Loftware provides Perrigo ongoing, uninterrupted technical support through its various deployment cycles, even beyond implementation. It has also successfully addressed requirements for configurable applications, feature updates and enhancements, and configurations across globally distributed locations. Perrigo has leveraged Loftware's Professional Services Group for insights into labeling best practices and optimal solution architectures that satisfy their unique and specific requirements.

> *Through the use of Loftware Spectrum at our global locations, Perrigo has been able to gain greater data consistency and integrity. Our network now leverages a standardized labeling solution that is flexible and scalable to meet the needs across our global locations.*
>
> - Charles Terpstra, Sr. IT&S Global Applications Manager at Perrigo Company

Company Overview

W.L. Gore is an American material sciences company with globally distributed operations. Its product portfolio is used in a diverse range of applications from life sciences and medical to apparel, automotive, and even space exploration (its components were used in the Perseverance Rover, the latest to land on Mars). The company has over 10,000 employees with revenues of over $3 billion. From the standpoint of enterprise application investment, Gore is committed to the Oracle platform within the Medical Products division and requires applications to integrate with various modules to maintain data integrity across its global operations.

Relationship with Loftware

W.L. Gore has had a long-standing relationship with Loftware, first selecting its labeling solution for the Medical Products division in 2005 as a potential replacement for several disjointed labeling applications. The company has come a long way since replacing their past legacy, disparate labeling systems with a modern, enterprise solution and now considers Loftware a critical partner in its labeling-related success. Since its initial investment in Loftware Print Server and now Loftware Spectrum, Gore has seen tremendous improvements to several business functions—including customer responsiveness, ability to consistently meet regulatory requirements, and gain process efficiencies. The company now uses a single server to control all of its labeling globally, which helps it optimize the label design and development process and achieve data consistency across various locations. For instance, Gore creates sample label PDFs with digital images for review across locations, which used to be a manual job and took designers anywhere from 1 day to 30 days; this process today takes 1-15 minutes due to the built-in ability of Loftware's Spectrum to utilize integrations in place, which is a remarkable improvement.

Gore prides itself on the strength of its relationship with Loftware and has leveraged the support teams help with configuration requests based on its unique requirements. One of the biggest decision drivers for the Company's continued investments in Loftware has been its uninterrupted support and the ability to address suggested changes as they arise. It is also critical for Gore that the labeling platform to be tightly integrated with Oracle Agile PLM and ERP, which is a proven capability Loftware offers. While the company develops integration protocols internally, it consults with Loftware to ease the process and to ensure there are no unnecessary complications for the same. Solution scalability is also critical, especially as Gore looks to integrate newer locations and set up production facilities. Loftware's adaptability and flexibility also make it effortless to setup in new locations.

> *"We truly appreciate the collaborative relationship that we have with Loftware. The labeling application significantly improves productivity with manual processes like label image review that took up to 30 days now completed in a matter of minutes."*
>
> - Michael Kinnett, Product Labeling (Medical Products Division), W. L. Gore & Associates

Company Overview

Epredia was formed in 2019 when PHC Group acquired a business unit from Thermo Fisher Scientific. The company has a broad portfolio of solutions designed for the anatomical pathology market, especially focused on precision cancer diagnostics and has various manufacturing facilities spread across the globe. Epredia has a total of around 1,200 employees across China, Germany, Switzerland, the United Kingdom, and the United States. It is powered by key customer brands such as Erie, Menzel, Microm, Richard Allan, and Shandon.

Epredia's Internal Labeling History

Epredia has had a history of having its globally distributed teams evaluate and implement various labeling solutions based on need and was looking for a labeling solution that reduced manual intervention and substantially improved overall labeling quality. The company's IT team is currently making a concerted effort to consolidate company-wide systems, including labeling, to automate and standardize its internal labeling processes across various locations.

Relationship with Loftware

Epredia started with a transition to the NiceLabel Cloud system (now part of Loftware) for its North American locations in Kalamazoo MI and Portsmouth NH on September 1, 2020. These facilities generate thousands of labels per day and are now "fully standardized." Its Shanghai location went live with the platform on May 1, 2021, and the Company is expected to roll out the solution in other locations in due course. For Epredia, it was critical for its chosen labeling partner to address key requirements—integrated SAP validation; ability to handle complex labeling requirements; enable business continuity; offer reasonable "go live" timelines; and cloud-hosting capability. Business continuity is critical to all of Epredia's enterprise application investments. The Company appreciates the efforts taken by the NiceLabel team to ensure minimal impact on downstream operations in case of system failure or connectivity challenges, including the ability to choose labeling templates from the local cache.

Epredia has had a "remarkable" experience with the labeling solution provider's support team as part of its service agreement. With this, the Company's IT team has had global 24x7 access to NiceLabel product experts who offer quick resolutions and minimize downtime. Most of the labeling implementation and project execution have happened during the pandemic with stringent remote work requirements; however, the NiceLabel team has managed to meet expectations across several different time zones—in China, Europe, India, and the US—leveraging its ready-to-use ABAP package that enables print previews for label templates and can be tightly integrated with SAP systems in no time.

> *"NiceLabel Cloud is just what we needed at Epredia. It offers a broad range of functionalities, which are all very user friendly. Anyone can become conversant with this labeling platform in a short period of time."*
>
> - Veerendra Krishnan, Senior Systems Analyst at Epredia

About The Authors

Richa Gupta is a Consultant working for VDC's AutoID & Data Capture practice. She has been tracking the markets for a range of AIDC technologies at VDC since 2010, including, but not limited to, barcode scanners and printers, labeling solutions, machine vision solutions, and robotics automation. Over the years, she has undertaken market opportunity sizing and forecasting, competitive landscape analysis, and offered strategic marketing assistance, while also providing valuable thought leadership for this technology segment. Richa holds a degree in Computer Engineering and an MBA from India.

David Krebs has more than 10 years of experience covering the markets for enterprise and government mobility solutions, wireless data communication technologies, and automatic data-capture research and consulting. David focuses on identifying the key drivers and enablers in the adoption of mobile and wireless solutions among mobile workers in the extended enterprise. David's consulting and strategic advisory experience is far reaching and includes technology and market opportunity assessments, technology penetration and adoption enablers, partner profiling and development, new product development, and M&A due diligence support. David has extensive primary market research management and execution experience to support market sizing and forecasting, total cost of ownership (TCO), comparative product performance evaluation, competitive benchmarking, and end-user requirements analysis. David is a graduate of Boston University (BSBA).

About VDC Research

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