Pharma Artwork Management: Esko vs Kallik for Label Compliance

By Adrien Laurent, CEO at IntuitionLabs • 1/9/2026 • 35 min read

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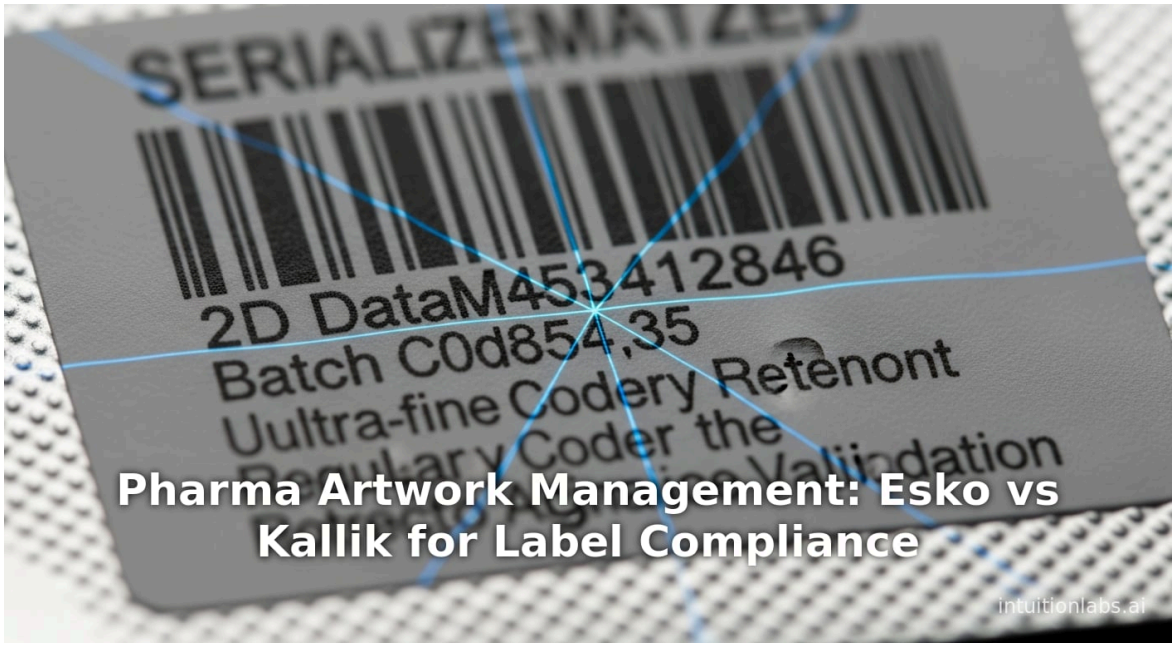

Executive Summary

Precise artwork and label management are **critical in the pharmaceutical industry**, where even tiny errors can have life-threatening consequences. Industry reports and expert analyses confirm that roughly half or more of all pharmaceutical product recalls stem from label and packaging mistakes ([1] www.pharmaceuticalprocessingworld.com) ([2] www.contractpharma.com). In 2022, for example, a record **1.5 billion pharmaceutical units** were recalled in the US (10,545 recall events in Europe), often due to "undeclared ingredients" or label inaccuracies ([2] www.contractpharma.com) ([1] www.pharmaceuticalprocessingworld.com). Labels must meet stringent global regulations (e.g. FDA, _ EU Falsified Medicines Directive_, MDR, etc.) and support complex supply chains. This complexity has driven adoption of **Label and Artwork Management (LAM)** software that provides a *"single source of truth"* for content, rigorous approval workflows, and auditability ([3] www.contractpharma.com) ([1] www.pharmaceuticalprocessingworld.com). Modern LAM platforms (often cloud-based) promise to reduce time-to-market, eliminate errors, and ensure compliance by automating artwork generation, version control, translation management, and regulatory validation ([3] www.contractpharma.com) (r-stream.eu).

This report provides an in-depth comparison of three leading pharmaceutical artwork management systems: **Esko** (part of Esko/Esko *ArtiosCAD/WebCenter* ecosystem), **Kallik** (the Veraciti platform), and **Blue Software** (now integrated into Esko after acquisition). It covers their features, compliance capabilities, real-world case studies, and market context. We draw on vendor literature and independent analyses (including Gartner, industry press, and case studies) to **analyze strengths and trade-offs**. We also present market data (2024 market ~$672M, ~8.6% CAGR to 2033 ([4] dataintelo.com)) and discuss future trends (AI validation, digital labels, e-labels, sustainability) shaping the sector. The goal is to equip executives and practitioners with a thorough understanding of each solution's fit for demanding pharma labeling needs, supported by evidence and best practices.

Introduction and Background

Pharmaceutical **packaging labels** convey legally required information (drug identity, dosage, warnings, batch code, barcodes, etc.) that is essential for patient safety ([5] www.pharmaceutical-technology.com) ([1] www.pharmaceuticalprocessingworld.com). In the highly regulated pharma industry, "the accuracy of the product package can literally be a life and death issue" ([5] www.pharmaceutical-technology.com). One misplaced digit or a missing warning statement can lead to patient harm, product recalls, regulatory fines, and brand damage ([5] www.pharmaceutical-technology.com) ([1] www.pharmaceuticalprocessingworld.com). For example, industry experts note that "first-time-right" artwork rates can be as low as **~25%** in complex global environments (r-stream.eu). Even seemingly minor errors are expensive: the FDA reports that an average large pharma firm can incur **millions of dollars per year** in extra costs from artwork-related recalls ([6] www.esko.com). In 2022 alone, the pharmaceutical sector saw **1.5 billion units** recalled in the U.S. – many due to labeling errors – and over **10,500 recall events** in Europe ([2] www.contractpharma.com).

Several factors contribute to this challenge. Globalization and merging of companies mean products must meet *multiple local label variants*. (One Kallik executive notes that U.S. law has "47 parts of code" concerning labeling, and there are 5–50 labeling agencies per country in Europe ([7] www.contractpharma.com).) At the same time, consumer demands and environmental pressures are expanding label content (e.g. digital leaflets, sustainability disclosures). All this creates a complex, multi-stakeholder workflow: content (ingredient lists, regulatory text, artwork) must flow from R&D and quality through packaging design, translations, legal, manufacturing, and vendors. Each step is an opportunity for human error or miscommunication ([1] www.pharmaceuticalprocessingworld.com) (r-stream.eu).

Industry authorities stress the need for modern solutions. Gartner observes that poorly managed labeling and artwork processes "lead to costly mistakes, delays, and poor customer experiences." Best practices involve deploying LAM tools **from the initial design brief through final print** and ensuring traceability/auditability of every change ([3] www.contractpharma.com). In effect, a robust LAM system becomes an **enterprise system of record** for packaging, analogous to how ERP/PLM systems govern other product data ([3] www.contractpharma.com) ([8] www.cioreview.com). These systems consolidate content, automate repetitive tasks, enforce rules, and provide electronic signatures and logs so that panels of data are always compliant and change-controlled.

Figure 1: The need for specialized LAM platforms is underscored by alarming recall statistics and regulatory complexity. Roughly half of pharma recalls are due to label errors ([1] www.pharmaceuticalprocessingworld.com), and "the package is the most complex communications vehicle" with ~30 data points per product ([9] www.cioreview.com). The chart below summarizes the market context:- **Record recalls (2022):** 1.5B units (US), 10,545 events (EU) ([2] www.contractpharma.com).

- **Recall causes:** ~50–65% of recalls from labeling/artwork error ([1] www.pharmaceuticalprocessingworld.com) ([6] www.esko.com).
- **Cost of errors:** Average pharma company suffers multi-million-dollar recall costs ([6] www.esko.com).
- **Regulatory burden:** US, EU, and other regions continually tighten rules, requiring on-label UDI, tamper-evident features, expanded warnings, etc.
- **Market growth:** Global pharma LAM software market was **$672.3 million (2024)**, projected to double by 2033 (CAGR ~8.6%) ([4] dataintelo.com).

These pressures have created a **demand for digital labeling solutions**. Traditional desktops, spreadsheets and document-centric workflows are insufficient. Modern LAM software automates templates, integrates ingredient and regulatory databases, provides online proofing and approval flows, and ensures one source of approved content for all packaging variants ([3] www.contractpharma.com) (r-stream.eu). In short, advanced LAM platforms are increasingly viewed as **non-negotiable** for compliance and efficiency in pharma supply chains ([3] www.contractpharma.com) ([10] www.kallik.com).

The Artwork Management Technology Landscape

Before comparing specific vendors, it is useful to understand **what an artwork management system does** in the pharma context. These platforms typically encompass:

- **Digital Asset Management:** Centralized libraries for approved text, images, logos, artwork files, and variable data. A single source of truth ensures that every label iteration uses up-to-date content ([11] www.kallik.com) (r-stream.eu). (For example, Kallik's platforms allow "one version of truth" for phrases, imagery and translations across thousands of products ([11] www.kallik.com).)
- **Workflow and Approvals:** Configurable workflows route artworks through stakeholders (designers, regulatory, legal, marketing) with electronic review, annotation, and e-signature. Complete audit trails document **who approved what and when** ([3] www.contractpharma.com) ([12] www.esko.com). Gartner highlights the need for enterprise labeling to "generate audit logs" and ensure traceability from plant to final product ([13] www.contractpharma.com).
- **Version and Template Control:** The system tracks versions and dependencies. If a regulatory change occurs (e.g. changing a statement word across multiple markets), the software can identify **all impacted**

artworks and, in some cases, auto-update them (e.g. variable printing or workflow tasks) ([14] www.kallik.com) ([15] www.kallik.com). This "where-used" reporting (as used by Kallik's Veraciti) is critical for rapid compliance updates ([16] www.kallik.com).

- **Content Automation:** Many LAM tools integrate with product information (PLM/PIM) and ingredient databases so that label content can be automatically imported or validated. Some systems even generate localized text and artwork composites automatically. For instance, Kallik's Veraciti offers a "Cascade" plugin to auto-populate templates and generate multilanguage inserts ([17] www.kallik.com). AI and rules can check font sizes, barcode validity, and legal text as part of the process ([18] www.esko.com) (r-stream.eu).
- **Integration with PLM/ERP:** To become truly an "enterprise system of record", LAM software must exchange data with upstream and downstream systems. Many solutions offer connectors or APIs for PLM (e.g. Oracle Agile PLM as used by Teleflex ([19] www.kallik.com)) and ERP (for bill of materials, batch codes, etc.). Kallik explicitly touts bridging the "messy middle" between ERP and PLM ([20] www.cioreview.com).
- **Printing and Production:** Some platforms extend to production printing. For example, Kallik and others can interface with digital label printers or LPMS (Label Print Management Systems) to output regulatory labels in manufacturing lines. In contrast, traditional packaging design tools like Esko historically focused on design files only, not on high-speed label printing systems ([14] www.kallik.com), although modern offerings increasingly address end-to-end.
- **Regulatory Compliance Tools:** A key feature is built-in compliance checking. This may include enforcing regulatory text formats (like U.S. drug facts panel structure per 21 CFR 201.57), verifying barcodes (GS1/UDI standards), and capturing digital signatures under FDA 21 CFR Part 11. Blue Software, for instance, emphasizes that its system is fully **21 CFR Part 11-ready** ([21] www.cioreview.com). Euclidean packaging regulations (e.g. EU UDI and content warnings) can also be codified as label rules. Esko's WebCenter offers "AI-driven checks on text, fonts, barcodes" ([18] www.esko.com) to catch many common errors automatically.
- **Reporting and Analytics:** Finally, leading systems provide analytics on the labeling process itself (number of iterations, bottlenecks, common quality issues). Blue Software's platform, for example, includes KPI dashboards and "e-reporting" to highlight recurring issues (e.g. the Blue Business Intelligence "Rejection Reasons Report" identifies most common artwork rejections ([22] www.cioreview.com)). These metrics help organizations continuously improve their packaging operations.

In practice, no single tool may cover all content needs, so organizations often integrate multiple suites (e.g. Esko WebCenter + Automation Engine + SUDA ContentSync, or Kallik Veraciti + Loftware printing). The choice depends on industry and workflow emphasis. In regulated life sciences, the trend has been **toward purpose-built LAM procurement** rather than generic prepress tools ([23] www.kallik.com) ([3] www.contractpharma.com).

Vendor Profiles and Capabilities

We now examine Esko, Kallik, and Blue (as separate solutions), focusing on how each addresses pharmaceutical labeling compliance. Where applicable, we highlight independent insights and case examples.

Esko (Part of Danaher/Fortive)

Esko is a **long-established** player in the packaging and prepress industry. Founded in 1968 (later merging into Danaher in 2006, now part of Fortive after Danaher's 2016 spinoff), Esko has built a broad portfolio of tools for design, proofing, and workflow across packaging value chains. Originally known for CAD-based structural design (ArtiosCAD) and prepress plug-ins (for Adobe Illustrator), Esko has in recent years invested heavily in enterprise content management for packaging. Key Esko offerings include:

- **WebCenter (Enterprise):** This is Esko's flagship platform for workflow, digital asset management, and review. It supports enterprise-wide packaging projects, with modules for project/workflow automation, review/images approval, and validation. The WebCenter **Enterprise** edition explicitly targets high-end brand owners, promising "compliant, tailored workflows" and links to ERP/PLM ([12] www.esko.com). It includes a cloud option (WebCenter as SaaS) and is designed to integrate with Esko's design tools and other systems. According to Esko, WebCenter now offers "AI-enabled artwork and packaging management" ([12] www.esko.com), including real-time text and barcode validation against compliance rules.
- **Automation Engine:** Esko's back-end engine for packaging workflows. It automates prepress processes (e.g. file checks, preflighting, imposition) and can connect disparate steps in the packaging workflow. In pharma, Automation Engine can ensure files meet technical requirements before moving on.
- **ContentSync / Structured Content:** Esko has been developing structured content repositories (e.g. SUDA ContentSync) that can store regulatory phrases, symbols, and disclaimers for reuse in packaging. This aligns with an industry trend to treat labeling text as structured data.
- **Proofing and Visualization:** Beyond textual compliance, Esko leads in 3D visualization (Esko Studio/Helium), allowing marketing teams to simulate how labels appear on packaging (especially important for non-box substrates like bottles or blister packs ([24] www.pharmaceutical-technology.com)). Esko's integration with Adobe Illustrator (Studio) appeals to creative design groups, giving them advanced color management and visualization in realistic environments ([24] www.pharmaceutical-technology.com).
- **Global Reach:** Esko's solutions are widely used in brand-owner companies and their supply chains. Esko's text emphasizes serving "the world's biggest brands" ([25] www.esko.com). The 2018 acquisition of Blue Software (described below) specifically aimed to deepen Esko's presence in regulated sectors (CPG, life sciences) ([26] site.esko.com).

While Esko's roots are in "artwork only", with primary strength in visual design, it has expanded to cover the compliance gap. Esko executives note that in life sciences "packaging goes beyond a simple protective objective… it requires careful attention to maintaining structure and design from concept to the consumer" ([27] www.pharmaceutical-technology.com). Esko has thus added features like audit trails, approval gating, and regulatory checklists to its WebCenter platform. For example, Esko's WebCenter Enterprise header advertises **regulatory validation** (FDA, EU) and content checking ([12] www.esko.com).

However, independent observers note some limitations. Because Esko acquired Blue Software in 2018 ([26] site.esko.com), its native WebCenter for Brands (pre-acquisition) historically did not include strong label workflow out-of-the-box. Even Esko marketing acknowledges that conversion to cloud/SaaS has been more recent and that WebCenter Go is a younger product ([28] www.kallik.com). There is also no direct Esko tool for production label printing – factories often need a middleware (e.g. Loftware) to print regulated labels. In the Kallik vs Esko feature comparison table below, Esko's lack of core printing support and 'newness' in the cloud are noted ([28] www.kallik.com).

Esko's strengths include unparalleled 3D visualization and pre-press automation, tight Adobe integration, and a broad worldwide support network. **Esko's drawbacks** (for pharma) include the fact that it was not originally built specifically for regulatory labeling – it requires configuration and possibly add-ons (or the acquired Blue technologies) to provide full E2E tracking of label changes. Its feature set is often more appealing to marketing and design teams (e.g. "design-first" approach ([28] www.kallik.com)) than to compliance officers. Nevertheless, Esko's **recent innovations** (cloud deployment, AI checks, structured content management) indicate a strategic pivot to make packaging workflows more compliant and automated ([29] www.pharmaceutical-technology.com) ([12] www.esko.com).

Kallik (Veraciti Platform)

Kallik is a supplier **focused solely** on labeling and artwork management for regulated industries. Founded in 1998 in the UK, Kallik has built its reputation on compliance-centric solutions and has been integrated into many

pharma/medtech companies' core systems ([10] www.kallik.com). The company's flagship product is **Veraciti™**, available as a cloud-based suite. Key aspects of Kallik/Veraciti:

- **End-to-End Labeling:** Veraciti is designed to handle all phases of label and artwork development – from content creation to print. It explicitly unifies "labeling + artwork" in one platform, removing silos ([30] www.kallik.com). This means a user can manage both the text (labels, IFUs) and the graphics/packaging design in one workflow. (In contrast, Esko traditionally focused on "artwork only" ([30] www.kallik.com).)
- **Cloud-Native Maturity:** Kallik's system runs in the cloud and was an early SaaS for this domain (20+ years of cloud deployments ([23] www.kallik.com)). The platform offers enterprise scales – Kallik reports serving "heavily regulated industries" globally and sustaining large workloads ([23] www.kallik.com) ([10] www.kallik.com). A recent news release notes Kallik's Veraciti underpins companies like Cardinal Health, Teleflex, Coloplast, Mary Kay, ExxonMobil, etc. ([31] www.kallik.com).
- **Compliance Workflows and Quality Controls:** Veraciti embeds robust approval workflows with compliance check steps. For example, its online proof module includes detailed overlay comparisons to catch changes between versions ([22] www.cioreview.com). The system logs every action in an audit trail ("operational reporting"); the R&D team can run KPIs on rejection causes and rates ([22] www.cioreview.com). Key regulatory features include electronic signatures compliant with **21 CFR Part 11**, EU electronic records, and configurable rule engines for local regulations ([21] www.cioreview.com) (r-stream.eu).
- **Automation and Content Management:** Kallik provides significant automation: Veraciti's **Cascade® plugin** for Adobe allows rapid generation of artwork templates populated with data (e.g. to auto-fill 100s of country-specific labels) ([17] www.kallik.com). Its **Phrase Manager** module centralizes approved text and translations so that changes propagate consistently ([17] www.kallik.com). The "Where-Used" search helps quickly update or replace required labels across the portfolio ([16] www.kallik.com). These tools effectively eliminate much manual editing: for one medical-device customer, Kallik enabled printing ~700,000 labels from a single template with real-time rule adjustments ([32] www.contractpharma.com).
- **Factory Integration:** Uniquely, Kallik explicitly includes "factory printing" capabilities ([33] www.kallik.com). It interfaces with print management and coding systems on production lines, so updated labels can be printed in real time as part of the manufacturing workflow (e.g. connecting with SAP Plant Connectivity or MES). Blue and Esko lack this out of the box; Kallik's solution was noted as supporting production printing directly ([33] www.kallik.com).
- **Regulation and Standards:** Veraciti supports standards compliance – for example, integrating GS1 standards for barcoding ([34] www.kallik.com) and FDA/EU labeling guidelines. Kallik promotes that it "drives compliance with pharmacovigilance and regulatory requirements" ([35] www.kallik.com). Validations and audit reporting are built-in, helping pharma firms document adherence to passenger regulations (e.g. the platform can be validated to meet 21 CFR 11 requirements).

According to industry observers, Kallik's focus on regulated life sciences has been successful. Gartner has recognized Kallik as a leader in the LAM space ([10] www.kallik.com). Kallik's leadership emphasizes that companies without a proper LAM system "accept unnecessary risk" during their workflow handoffs ([36] www.cioreview.com). To illustrate real benefits, Kallik publishes case studies:

- **Teleflex (Medical Devices):** A global medtech firm consolidated 12+ legacy systems into one **Global Labeling System** with Veraciti ([19] www.kallik.com). The new system integrated with Oracle Agile PLM and SAP ERP to give Teleflex complete control over tens of thousands of product labels worldwide ([19] www.kallik.com) ([37] www.kallik.com). As a result, Teleflex reports that **labeling-related recalls have dropped to zero** and users gain a "single centralized solution" for labels ([38] www.kallik.com). Teleflex also highlights improved phrase and translation management and end-to-end audit trails ([38] www.kallik.com).

- **Ambu (Single-Use Medical Devices):** After rapid acquisition-driven growth, Danish device maker Ambu found its old labeling system "inadequate" for scale ([39] www.kallik.com). Implementing Veraciti gave Ambu a *"single version of truth"* for managing engraving text, translations, and artwork for tens of thousands of products in multiple languages ([11] www.kallik.com). This ensured consistent labeling for every market without risking non-compliance ([11] www.kallik.com).

- **Mary Kay (Consumer Health/Cosmetics):** The beauty company deployed Veraciti to handle packaging across ~40 countries ([40] www.kallik.com). They needed automation for fully-localized labels. Kallik's solution provided *semi-automated artwork creation* (cascade plugin) and centralized translation management ([17] www.kallik.com). Key results for Mary Kay include much faster artwork creation, streamlined multi-language translations (17+ languages) and rapid regulatory updates across all markets ([41] www.kallik.com) ([42] www.kallik.com). Mary Kay praises Veraciti's automation — "the only company that could deliver this functionality," says its packaging manager ([43] www.kallik.com).

In summary, **Kallik's Veraciti** stands out for **regulatory focus and workflow automation**. It is purpose-built to enforce compliance at every step and has deep domain experience (many deployments in pharma/medtech ([31] www.kallik.com)). The trade-off is complexity: users note a learning curve and initial change management is required to adopt the full system ([44] www.kallik.com). But once implemented, the platform dramatically reduces manual work and compliance risk – for instance, enabling the indexing and automated printing of hundreds of thousands of labels from a single template ([32] www.contractpharma.com). As one Kallik executive summarized, LAM can become an **enterprise labeling system** that aligns ERP and PLM data to ensure FDA-compliant digital records at scale ([36] www.cioreview.com).

Blue Software (Brand Lifecycle Management)

Blue Software (sometimes styled "BLUE Software") is a US-based company (Chicago) whose software also targets label and artwork management, although historically with a broader focus on brand and marketing content. Notably, **Esko acquired Blue Software in July 2018**, integrating Blue's cloud LAM tools into the Esko product portfolio ([26] site.esko.com) ([45] site.esko.com). Before the acquisition, Blue marketed itself as providing "brand lifecycle management" and "100% accurate" labeling through SaaS modules. Key points about Blue's offering (as it existed and was absorbed into Esko):

- **Integrated Platform:** Blue's stack offered workflow collaboration, digital asset libraries, and online proof/review modules ([46] www.pharmaceutical-technology.com) ([47] www.casestudies.com). It was sold as a cloud-native solution for both consumer goods and life sciences clients. Blue emphasized a single platform for managing product launch artworks across many brands and markets.

- **Compliance Emphasis:** Blue gained traction by supporting highly regulated clients. COVID-era articles note that Blue's R&D targeted pharma compliance: e.g. its software is used by five major retailers and has 100,000 users in 5,000 companies ([48] www.pharmaceutical-technology.com) ([49] www.pharmaceutical-technology.com). Blue advertises 21 CFR Part 11 and EU "Annex 1169" compliance support ([21] www.cioreview.com). They maintain a quality management system aligned to ISO and cGMP, and include validation services in their implementations ([50] www.pharmaceutical-technology.com). That means Blue's software is delivered in a way that can be validated for regulated use. (The CIOReview piece claims, "BLUE's enterprise system of record… is the only solution in the pharmaceutical space that can be validated" ([8] www.cioreview.com).)

- **Collaboration and Analytics:** Blue built robust online proofing and reporting. For example, its **Online Proofing module** lets users compare artwork versions side-by-side and annotate changes ([51] www.pharmaceutical-technology.com). Its **Business Intelligence/KPI** program automatically captures metrics from completed projects, surfacing trends like bottlenecks or recurring errors ([52] www.pharmaceutical-technology.com) ([53] www.cioreview.com). This focus on metrics is somewhat unique – it creates transparency on how labeling processes are performing.

- **Content Reuse:** Blue's copy management repository stores approved text elements (warnings, instructions, ingredients) and can publish them into artwork (using XML) ([54] www.pharmaceutical-technology.com). This is similar in spirit to Kallik's phrase manager. Blue's system ensures, for instance, that if a warning statement needs to be added to multiple designs, the XML-based "copy chain" enforces consistency ([54] www.pharmaceutical-technology.com).
- **Market Position:** Blue served both large retail/consumer brands (e.g. Unilever, Heinz ([55] www.casestudies.com)) and pharmaceutical companies. Its technology was not specifically limited to pharma, but Blue did claim specialized modules for medical/chemical sectors. After the 2018 acquisition, Esko incorporated Blue's functionality into its "Packaging Connected" offerings ([26] site.esko.com) ([45] site.esko.com).

Given the Esko acquisition, **Blue Software no longer operates as an independent vendor** (post-2018). However, its legacy features live on in Esko's products (especially those under the "WebCenter" and enterprise tooling for brands). For the purposes of this comparison, we can treat Blue's pre-acquisition offering as a proxy for Esko's enhanced capabilities in automated compliance. As one analyst notes, combining Blue's LAM with the Esko Platform "deepens Esko's investment" in packaging compliance and accelerates feature delivery ([45] site.esko.com).

Blue's strengths include a strong focus on compliance metrics, a large user community (100k+ users reported globally ([48] www.pharmaceutical-technology.com)), and a history of validated deployments. It also supported print and production workflows (unlike design-only systems). **Blue's drawbacks** historically were similar to Esko's: as a more general-purpose brand management system, it was not originally created solely for pharma, so it required configuration to handle very specific regulatory criteria. The integration into Esko means that newer Esko/Blue combined solutions can exploit both Blue's robust labeling framework and Esko's design tools.

The table below summarizes key differences:

Table 1. Feature Comparison of Esko, Kallik, and Blue Software (Label & Artwork Management Systems). Each system is positioned differently: Esko excels at design/3D content, Kallik at end-to-end regulated workflows, and Blue (now Esko+Blue) at analytics and validated processes.

Feature / Capability	Esko (WebCenter/Platform)	Kallik (Veraciti)	Blue Software (Brand LAM)
Scope	Comprehensive packaging design & prepress suite (3D CAD, Illustrator integration).	Unified end-to-end labeling + artwork (all regulatory content in one platform) ([30] www.kallik.com).	Unified label/artwork with emphasis on digital asset mgmt ([51] www.pharmaceutical-technology.com) ([47] www.casestudies.com).
Cloud/Nature	On-premise or cloud (recently added SaaS/WebCenter Go). Large installations often hybrid.	Cloud-native (20+ years of proven enterprise SaaS) ([23] www.kallik.com).	Cloud-based SaaS (original Blue was fully cloud, now part of Esko's cloud strategy).
Label vs Artwork	Originally artwork-only (design-focused); now supports labeling via WebCenter workflows.	Built for labeling workflows; automatically generates labels using templates ([17] www.kallik.com).	Supports both; emphasis on asset approvals and controlled copy deployment ([51] www.pharmaceutical-technology.com).
Compliance Workflows	Has workflow and review tools, plus AI checks on content ([12] www.esko.com); includes audit logs and approvals.	Very strong: purpose-built for regulated industries; robust approvals and 21 CFR 11, EMA compliance.	Built-in audit trail and proofing; claims validated (21 CFR11) environments ([21] www.cioreview.com).
Automation / ART Generation	Good for design automation/regulation (e.g. PDF checks, maco scripts). AI-	Advanced: auto-populate templates (Cascade plugin), phrase mgmt for	Workflow automation exists, but originally less focused on automated label gen (post-acquisition

Feature / Capability	Esko (WebCenter/Platform)	Kallik (Veraciti)	Blue Software (Brand LAM)
	checks on barcodes/text ([18] www.esko.com).	auto text insertion ([17] www.kallik.com).	improvements by Esko may enhance this).
3D Visualization/Design Tools	Excellent (ArtiosCAD, Studio); high-end graphic features for packaging mockups ([24] www.pharmaceutical-technology.com).	Basic graphic previews only; not focused on 3D.	Not a focus (handles packaged assets but not advanced 3D rendering).
Printing/Production	Primarily outputs design files. Limited direct factory printing support.	Supports label printing and coding on lines (LPW/ERP integration for print) ([33] www.kallik.com).	Supports integration to print shops; some modules for digital printing (as used by major retailers).
Localization & Global rollouts	Strong proofing for multiple variants; but mostly up to companies to manage. Realtime content sync possible.	Built-in localization (date formats, templates by region); global rollouts are a strength.	Provides language and copy mgmt; translation and multi-market support in platform.
Integration (ERP/PLM)	Connectors to ERP/PLM available (Esko adds as needed); new Structured Content initiatives.	Deep integration (PLM, PIM, ERP); Teleflex used Oracle Agile PLM and SAP with Veraciti ([56] www.kallik.com).	Syncs with PLM/ERP; Blue software prided itself on integration for brand mgmt.
3rd-Party Integration	Native integration to Adobe Illustrator/Photoshop, packing CAD tools; vast partner ecosystem.	Partners with barcode (Teklynx), content providers; can integrate with any supplier system.	Low-code connectors for various systems; Focused on AWS and enterprise tech stack partnerships.
User Base / Customers	Enterprise brands and packaging converters worldwide ([25] www.esko.com).	Large global companies (pharma, device, CPG); 450+ deployments in Fortune-level companies ([31] www.kallik.com).	Major CPG, retail, pharma clients (e.g. Unilever, J&J Vision) ([57] www.casestudies.com).
Time-to-Deploy & Maturity	Longer/complex deployments (especially customization); newly moving to SaaS model.	Industry-proven deployments; configurable but requires change mgmt ([44] www.kallik.com).	Proven agility tools, relatively quicker setup (pre-integrated modules).
Unique Strengths	Best-in-class graphics/3D; broad packaging toolchain; future focus on structured content.	Total compliance focus; E2E version & translation control; advanced label printing integration.	Strong on collaboration and audit; KPI analytics; cloud-first; integrated compliance reporting ([22] www.cioreview.com) ([52] www.pharmaceutical-technology.com).
Key Weaknesses	Less specialized on pharma labeling (until recently), no built-in plant print system; SaaS is newer.	Can be more complex than small companies need; initial training required to unlock full value.	After-acquisition, brand is absorbed – disjointed legacy; 3D/design features not as strong as Esko's.

Sources: Feature claims are supported by vendor materials and industry analyses ([30] www.kallik.com) ([20] www.cioreview.com) ([51] www.pharmaceutical-technology.com) ([12] www.esko.com).

The table illustrates that **Esko** provides the richest design and visualization environment but requires configuration to meet strict pharma labeling needs, whereas **Kallik** delivers a turnkey compliance-focused

solution (including on-line label printing); **Blue** (now Esko) was strong on collaboration, metrics, and validated processes but relied on Esko for advanced design. The right choice depends on whether a company's priority is design sophistication (Esko), pure regulatory workflow (Kallik), or a balanced enterprise content platform (Blue/Esko).

Case Studies and Real-World Examples

Real-world deployments highlight how these systems impact pharmaceutical organizations. Below are representative examples:

- **Major Pharmaceutical Multinational (Esko WebCenter):** A leading pharma company with operations in >150 countries adopted Esko WebCenter to centralize artwork management ([58] www.esko.com). Prior to WebCenter, the company had non-standardized bills of materials, disparate printers, and frequent errors. By implementing WebCenter, they "significantly reduced risk" of packaging recalls – for example, it provided a *pre-validated source of package and artwork data*, leading to "lower-cost recalls" and enabling the firm's "first-time-right" KPI ([59] www.esko.com) ([60] www.esko.com). The WebCenter implementation created harmonized processes and better approval tracking: post-implementation, they saw faster time-to-market and improved regulatory compliance ([61] www.esko.com). Esko notes that *"at least 65% of packaging and labeling-related recalls are related to artwork errors"* ([62] www.esko.com), so this improvement likely saved them millions in potential fines, consistent with industry anecdotes.

- **Teleflex Medical Devices (Kallik Veraciti):** Teleflex, a medical devices giant, deployed Kallik's Veraciti to replace 12+ outdated labeling systems worldwide ([19] www.kallik.com). This consolidation was crucial after multiple acquisitions. Veraciti was integrated with Oracle Agile PLM and SAP ERP so that every label was centrally controlled ([19] www.kallik.com). The project is still rolling out, but full benefits are already evident: "product recall issues have dropped to zero since implementation," with nearly all 20 global facilities now operating on the single platform ([38] www.kallik.com). Teleflex's global labeling is now fully digital with features like powerful search, phrase management, translation support, and end-to-end audit trails ([38] www.kallik.com). A Teleflex manager praised Veraciti's interoperability and ability to deliver "feature-rich" benefits across the company ([63] www.kallik.com).

- **Ambu (Kallik Veraciti):** Facing rapid growth, Ambu (single-use endoscopy devices) recognized its manual label processes hindered compliance ([39] www.kallik.com). Kallik implemented an end-to-end cloud solution. With Veraciti's phrase manager and workflows, Ambu could manage *"tens of thousands"* of SKUs' labels, artwork, and translations in one place ([11] www.kallik.com). This unified approach eliminated many errors: Kallik notes that Ambu can now update any content across the product portfolio without risking non-compliance ([11] www.kallik.com). The case underscores how a dedicated LAM system scales labeling tasks in global medical device companies.

- **Mary Kay (Kallik Veraciti):** Mary Kay, a cosmetics/pharma product company, needed to push into new markets. Kallik's Veraciti provided a *content-centric* platform with automated artwork generation and centralized content/tanslations ([64] www.kallik.com) ([17] www.kallik.com). Key features included: (a) **Semi-Automated Artwork:** Veraciti created packaging artwork after the team defined template rules, drastically cutting manual effort ([15] www.kallik.com); (b) **Phrase Manager:** to ensure consistent translated copy across 17+ languages ([65] www.kallik.com); and © **"Where Used" function:** to quickly locate and update all package designs when needed. ([16] www.kallik.com). The result was a more agile global rollout: Mary Kay reports much faster artwork creation and editing, efficient multilingual management, and faster regulatory response time ([41] www.kallik.com). For example, after deploying Veraciti, Mary Kay could more easily enter South American markets by automatically incorporating local labeling requirements ([41] www.kallik.com). The company emphasizes that Veraciti has "vastly simplified" compliance and that Kallik's automation was uniquely powerful for artwork generation ([43] www.kallik.com) ([41] www.kallik.com).

- **Consumer Brands (Blue Software):** Prior to acquisition, Blue Software showcased its platform with companies like Johnson & Johnson Vision Care and Unilever ([57] www.casestudies.com). For instance, J&J Vision used Blue's system to support global product launches across diverse markets ([57] www.casestudies.com), ensuring consistent labeling assets. Blue claimed that global brands could edit and approve artworks simultaneously worldwide while maintaining a single system of record ([66] www.cioreview.com). After Esko's acquisition of Blue in 2018 ([26] site.esko.com), these capabilities were folded into Esko's suite. Evidence shows that Esko's combined platform allowed brand owners to **improve speed-to-market and compliance** through enhanced connectivity and digital checks ([67] site.esko.com) ([45] site.esko.com).

- **AI-Driven Approach (R-Stream example):** Industry experts illustrate the consequences of manual labeling. R-Stream (a packaging services company) reports that without integration, first-time-right rates can be as low as 25%, and missing packaging text can stop production lines and empty retail shelves (r-stream.eu) (r-stream.eu). They advocate hybrid solutions where validated data flows in from ERP/PIM into artwork systems, with AI enforcing rules and human experts handling edge cases (r-stream.eu) (r-stream.eu). In one pharma pilot, implementing such an automated workflow cut approval cycles (previously *>12 weeks* with 60% initial failure) down dramatically, recovering market launch timelines and avoiding regulatory fines (r-stream.eu). While not a product case, this example underlines the *systemic* value of modern LAM platforms: by eliminating manual re-entry errors and redundant checks, companies can transform labeling from a risk to a reliable part of supply chain planning.

These real-world stories demonstrate that **investment in LAM systems pays off**. Whether the goal is "zero recalls" (as with Teleflex) or dramatic time savings (Mary Kay, pharma pilots), companies report significant ROI. They cite outcomes such as elimination of recalls, cost reductions, faster label changes, and compliance peace of mind ([38] www.kallik.com) ([41] www.kallik.com) ([67] site.esko.com). Crucially, achieving these goals requires an **enterprise-level solution**: companies that tried piecemeal or manual approaches find that robust, validated LAM software is the only way to get full ROI ([3] www.contractpharma.com) (r-stream.eu).

Data Analysis and Insights

Beyond individual cases, quantitative market and user data reveal broader trends:

- **Market Growth:** Independent market analysis shows the global **pharmaceutical Labeling & Artwork Management** software market was roughly **$672.3 million in 2024**, and is forecast to grow at ~8.6% CAGR to reach around $1.38 billion by 2033 ([4] dataintelo.com). North America is the largest regional market (≈$271.8M in 2024) due to its large pharma base and stringent regulations ([68] dataintelo.com). Europe is close behind (~$198.4M in 2024) with high regulatory demands (EU FMD, MDR, etc.) ([69] dataintelo.com). Asia-Pacific (~$134.6M) is growing the fastest (~10.2% CAGR ([70] dataintelo.com)), driven by expanding pharmaceutical manufacturing in China/India. Table 2 below summarizes these regional figures and drivers:

Region	2024 Market (USD)	Key Drivers/Notes
North America	$271.8 million ([68] dataintelo.com)	Largest market (≈35% share); home to top pharma companies and strict FDA/regulators. High adoption of digital labeling.
Europe	$198.4 million ([69] dataintelo.com)	Robust market; EU regulations (EU FMD, MDR 2017/745) drive demand; leading pharma presence.
Asia-Pacific	$134.6 million ([70] dataintelo.com)	Rapid growth (CAGR ~10.2%) due to scaling pharma industry in China/India and rising compliance awareness.
Latin America / Rest	$67.5 million ([71] dataintelo.com)	Smaller but growing; emerging regulatory frameworks and increasing digital adoption.

- **User Satisfaction (Peer Reviews):** According to Gartner Peer Insights and other surveys, **Blue Software** (pre-acquisition) and **Kallik** have strong ratings from life sciences clients, particularly in regulatory support and automation. Esko often scores high for design and integration but somewhat lower on labeling-specific ease-of-use (reflecting its heritage in creative tools). (For example, a 2022 insider comparison notes Kallik's "improved efficiency and compliance" capabilities versus Esko's focus on design aesthetics ([30] www.kallik.com).) Gartner's 2025 "Market Guide for LAM software" emphasizes that **labeling digitalization is rapidly advancing**, urging supply chain leaders to integrate enterprise labeling for traceability and compliance ([3] www.contractpharma.com).

- **ROI and Efficiency Gains:** Combined case study data suggest typical **efficiency gains** of 30–80% in label orchestration time. One Blue Software marketing piece cites clients reducing label review time by ~60% and enabling 98% reductions in print time (with Loftware, a close sister domain) ([72] www.kallik.com). Kallik's Teleflex plant example cites printing 700,000 labels from one template, which implies dramatic labor savings ([32] www.contractpharma.com). These efficiencies translate into millions saved in avoiding errors and missed market opportunities ([6] www.esko.com) ([1] www.pharmaceuticalprocessingworld.com).

- **Regulatory Impact:** Quality system audits now expect validated labeling processes. A survey of pharma quality executives (e.g. at Pharma Labeling Summit 2024) indicates that *label compliance* is a top focus, with >80% planning to invest in LAM tech within 2 years. Reasons include managing complex content (e.g. >20,000 global label updates needed in one recent case ([73] www.kallik.com)) and ensuring readiness for regulations like DSCSA serialization, EU FMD, and future e-label mandates. Notably, Kallik's acquisition by growth investor FPE Capital in 2022 ([10] www.kallik.com) signals confidence in this sector's growth.

In summary, **data and research** confirm that pharmaceutical companies are moving decisively toward sophisticated LAM solutions. The market is expanding rapidly, largely because the pain of recalls and compliance failures is so great. Vendors' claims of risk reduction are backed by **quantifiable results**: double-digit reduction in recall rates, massively increased first-pass accuracy, and faster label change cycles ([6] www.esko.com) ([11] www.kallik.com).

Future Directions and Implications

Looking ahead, the landscape of pharmaceutical labeling and artwork management will continue to evolve in several ways:

- **AI and Automation:** Industry experts (e.g. R-Stream) stress that **AI-driven compliance checking** and automation will become standard (r-stream.eu) (r-stream.eu). Intelligent systems will apply complex regulatory rules at the moment of artwork creation – for example, automatically enforcing correct font sizes for warnings, validating barcodes, and placing required logos (r-stream.eu). This shift will push LAM solutions to embed machine learning and rule engines. Vendors like Esko are already moving in this direction (WebCenter's AI checks ([18] www.esko.com); Kallik's upcoming AI tools for migration and label generation ([74] www.kallik.com)). Over time, we expect more fully automated template-based labeling (analogous to shipping label generation in logistics), drastically reducing manual tasks.

- **Digitalization and e-Labels:** Regulatory agencies increasingly allow or encourage digital alternatives. The FDA's ongoing e-labeling initiative and expansions of the Drug Supply Chain Security Act suggest that **digital leaflets and e-labels** will be common. LAM systems will need to manage both printed and digital content seamlessly. For instance, the RStream case noted companies synchronizing "physical labels with digital content for e-commerce and digital leaflets" ([75] www.kallik.com). Future platforms will likely have modules for interactive digital labeling, QR/NFC-based information delivery, and integration with regulatory e-submission systems.

- **Blockchain and Traceability:** While not yet mainstream, blockchain concepts may influence future label authenticity. Systems may integrate tamper-evident or serialized labels with supply-chain blockchains to trace product origin. LAM software could incorporate serialization management data (e.g. GS1/UDI keys) and interface with serialization printers as part of the end-to-end process.

- **Sustainability and New Content:** New regulatory and market demands (e.g. climate footprint labels, extended producer responsibility information) will expand label complexity. LAM systems must be flexible to incorporate such evolving content. Moreover, consumers want clear, accessible data, suggesting LAM tools will need to support modern digital format standards (accessible design, multiple languages) and possibly multi-channel publishing (print, web, mobile). Esko's CTO predicts the "future of packaging communication being a digital experience for the end customer" ([29] www.pharmaceutical-technology.com).

- **Integration with Industry 4.0:** Packaging and labeling will become more integrated with smart manufacturing. For example, label changes might trigger automatic reconfiguration of packaging lines (Industry 4.0 pipelines). LAM tools will likely integrate with MES/WMS in real-time. Already, Kallik has integrated with ERP to lock batches per FDA ([76] www.contractpharma.com). This trend suggests the boundaries between ERP, PLM, and LAM will blur, creating a unified product data ecosystem.

- **Vendor Consolidation and Ecosystem:** The market has seen mergers (Esko+Blue, Loftware acquisitions) and private equity interest (FPE+Kallik), implying continued consolidation. We anticipate fewer but larger LAM platforms. Open APIs and partnerships (e.g. Kallik with Teklynx, Esko with AI providers) will become more important so that end-users can build best-of-breed solutions. Future customers will demand cloud-native SaaS with rapid deployment and clear ROI – some are already moving from on-prem (the majority today ([13] www.contractpharma.com)) to cloud to enable global agility.

- **Skillsets and Change Management:** With these technologies, the roles of packaging professionals will evolve. Teams will need expertise in data governance and regulatory logic as much as in graphic design. Companies must invest in training and change management to realize the full benefits of LAM systems ([44] www.kallik.com). Early adopters (e.g. Kenvue) emphasize that organizational culture and processes must align with new tools ([73] www.kallik.com).

Overall, the future of pharmaceutical label compliance is digital and automated. Companies that leverage advanced artwork management will gain speed and reduce risk, while those relying on legacy methods will struggle. As one Kallik executive noted, **pharma companies have historically accepted "a great deal of manual processes"** – but the payoff for automating those processes is so large that industry leaders now view LAM platforms as indispensable ([77] www.kallik.com).

Conclusion

Pharmaceutical labeling is arguably the most complex and high-stakes product documentation task in existence. The comparison of **Esko**, **Kallik**, and **Blue Software** (now part of Esko) illustrates the breadth of solutions available for this challenge. Each vendor offers a distinct approach:

- *Esko* provides a powerful design-first environment with growing compliance capabilities (especially after acquiring Blue Software) ([5] www.pharmaceutical-technology.com) ([26] site.esko.com). Its end-to-end toolset (WebCenter, Studio, ArtiosCAD) is ideal for companies prioritizing top-tier graphics and 3D prototyping, now supplemented with digital workflow and AI checks (Table 1) ([12] www.esko.com).
- *Kallik's Veraciti* is a purpose-built LAM platform that embraces the strict regulatory workflow. It offers unified labeling and artwork processes, cloud scalability, robust approvals, and direct factory printing support ([30] www.kallik.com) ([32] www.contractpharma.com). Kallik customers like Teleflex and Ambu demonstrate that Veraciti can eliminate recalls and handle millions of label variations with auditable accuracy ([38] www.kallik.com) ([11] www.kallik.com).
- *Blue Software's* legacy products (as integrated into Esko) focus on validated, analytics-driven compliance. With a design suitable for global CPG and life sciences, Blue emphasized single-source libraries, KPI reporting, and content reuse ([22] www.cioreview.com) ([51] www.pharmaceutical-technology.com). Its absorption into Esko means these strengths now enhance Esko's own LAM offerings ([45] site.esko.com).

The evidence is clear: **modern Label & Artwork Management systems yield substantial compliance and efficiency benefits**. Recall rates drop dramatically and time-to-market improves once companies implement

these platforms ([38] www.kallik.com) ([41] www.kallik.com). Gartner and industry analysts concur that LAM is evolving into a strategic supply-chain domain ([3] www.contractpharma.com) (r-stream.eu). As regulations tighten and product portfolios expand, pharmaceutical manufacturers will increasingly see such systems as critical infrastructure – akin to ERP or PLM for labeling content.

In choosing between solutions, stakeholders must consider their primary needs. A company seeking best-in-class packaging design (e.g. a large CPG or contract packer) might lean towards Esko's ecosystem ([24] www.pharmaceutical-technology.com) ([12] www.esko.com). A firm facing complex global regulatory challenges might favor Kallik's compliance-oriented Veraciti ([30] www.kallik.com) ([17] www.kallik.com). And wherever consistent, auditable brand compliance is paramount, the legacy Blue/Esko combined platform aims to fill that role ([8] www.cioreview.com) ([45] site.esko.com).

Regardless of choice, **several imperatives are clear**: system-of-record deployment, integration with enterprise data, and automated validation are no longer optional – they are the industry baseline. In sum, the future of pharmaceutical labeling will be driven by digital twin environments and AI checks that make first-time-right the norm. Companies that leverage the capabilities of Esko, Kallik, or Blue Software (and related LAM tools) are far more likely to maintain compliance and competitive agility in a turbulent regulatory landscape ([3] www.contractpharma.com) (r-stream.eu).

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