Closing The Information Gap: ERP-Enabled Inventory Visibility and Digital Cataloguing in A Design-Led, Multi-Tier Manufacturing Context

A Design-Science Case Study of Abhiyan Laminates

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***Abstract*—For product lines such as electronics or toys which are sold via several levels of distribution, products can be overstocked and not sell. The paper explores the case of Abhiyan Laminates, a medium sized Indian laminate manufacturer, by adopting the design-science approach. We believe that the real issue that prevents sell-out in such situations is the lack of visibility of the existing stock; and ERP investment can only address this issue when coupled with an external visibility layer and a staged adoption plan for channel partners. After three site visits, three structured management meetings, interviews with design professionals and manufacturer staff, the benchmarking visit and the vendor demonstration, we identify four gaps: Catalogue Stock mismatch, Distributor Visibility, Dead-stock and Readiness for Change. We then create a hybrid artefact, with a cloud ERP as the transactional backbone and a customised interface layer, which makes live availability and a catalog dynamic to approved buyers. The platform selection is done in two steps: qualifying and weighted scoring of the two platforms that have survived the qualification process: SAP Business One (4.40) and Oracle NetSuite (4.00), followed by a sensitivity analysis that indicates that the ranking does not change if cost and sector fit are not taken into account. About ₹63 lakh is the estimated cost of ownership over 3 years. The evaluation is analytical instead of measured, meaning that the propositions are given for testing.**

***Index Terms*—inventory visibility, ERP systems, information asymmetry, design science, laminate industry, channel adoption, SME manufacturing**

I. INTRODUCTION

Decorative laminates are selected based on their appearance. Colour, texture, finish and thickness make thousands of stocks keeping units (SKUs) and architects, interior designers and carpenters choose designs for particular projects. If a buyer is unable to verify that a selected design may be available, it is very possible the buy is in jeopardy as a different one is readily available. Even in the field, most of the industry is still selling on the basis of printed catalogues, sample books, phone calls and even big organised players that internally keep stock data in a centralized manner, providing customers only indirect access to availability.

It is clearly illustrated by Abhiyan Laminates, a vertical of the privately owned Abhiyan Group. It makes plywood and laminates, and sells it via approved regional distributors, dealers and professional buyers. This structure provides for reaching, but distributes stock information over independent locations.

The company didn't have any inventory or catalogue management system, aside from accounting software, and they already had a website and mobile application.

1. RQ1. What impact does disorganize stock information have on sell out, catalogue cost and working capital in Abhiyan, as compared to a lack of stock information?
2. RQ2. What ERP solution is best suited to Abhiyan's size, budget, and maturity level and just how strong is that option?
3. RQ3. Which integration strategy and deployment process can provide visibility to customers at a reasonable price and risk of adoption?

The paper has three contributions. It restates the problem in terms of information economics and as stated propositions (Section 2.5). It details two-stage requirements-based ERP selection along with a sensitivity analysis. And it provides a hybrid artefact that connects an ERP to the customer-facing channels that a company already uses, as well as a phased adoption plan.

II. LITERATURE REVIEW AND PROPOSITIONS

2.1 Information asymmetry and coordination

When one side of a market has more information about a product than the other, then this creates a distortion in the trade, as demonstrated by Akerlof (1970). The buyer of laminates has a similar dilemma, not one of quality but of availability: the design in the sample book could be discontinued or it may be of limited or local availability. Lee et al. (1997) demonstrate that demand information gets distorted as it flows from tier to tier within the supply chain and amplified upstream and Cachon and Fisher (2000) find that sharing inventory information can reduce the costs of the supply chain – and the magnitude of the reduction depends on the supply chain lead times and the batch sizes.

A related but textbook argument is that the distribution of different tiers of manufacturers, distributors and retailers creates bottlenecks in working capital and reduces response to demand (Chopra and Meindl, 2016); and regional distribution imbalances are frequently information failures, not volume failures (Christopher, 2011).

2.2 Product type and supply chain design

Fisher (1997) claims that innovative products, which have short life cycles, are variable and have unpredictable demand, require a responsive supply chain, not an efficient one. Design-driven laminates are in this category.

According to Kotler and Keller (2016), physical catalogues are expensive, inflexible and can become outdated rather quickly, while digital catalogues can be fluid and updated on the fly as they are connected to the stock.

2.3 ERP value and its limits

ERP systems are used to connect various business functions, by using a common database, and enhance data accuracy and cross-departmental coordination (Monk and Wagner, 2013). They are only available under certain conditions.

The advent of an enterprise system also brings its own data and process logic to the organisation, and thus requires adaptation by the organisation, warns Davenport (1998). Gattiker (2005) and Goodhue (2005) demonstrate that the benefits after the implementation are highly related to interdependency and differentiation of the units in an organisation, while Ngai, Law and Wat (2008) point out that the success factors that recur are management support, training and change management. In Indian manufacturing, failure has been found to be due to poor user adoption, not software mismatch (Pulluru, 2025). Most of this work is related to the integration of the inside.

2.4 Adoption by channel partners

To be successful, a customer facing layer is only successful if the distributors and professional buyers use it.

The technology acceptance literature offers an explanation of why they may not: perceived usefulness and ease of use (Davis, 1989) and performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh, Morris, Davis and Davis, 2003). These are not assumed in trades where relationships are important or where phone calls are important.

2.5 Gap and propositions

Two gaps follow. There is little research conducted on the use of ERP to provide visibility to customers, and little empirical research which includes the plywood and laminate industry in India.

We thus offer three propositions for analysis in Section 8:

1. P1. Uncertainty of availability, rather than shortage of inventory, restrains conversion when there are many aesthetically different items.
2. P2. Without shared data on the stock, multi-tiers can suffer from stock-outs and slow-moving stock at the same time.
3. P3. Only by investing in an external visibility layer and a channel partner staged adoption plan can ERP investment solve P1 and P2.

III. RESEARCH DESIGN

3.1 Approach

It is a study based on the design-science logic (Hevner, March, Park and Ram, 2004; Peffers, Tuunanen, Rothenberger and Chatterjee, 2007) namely problem identification, problem definition, design of artefact, demonstration and evaluation. Problem identification is undertaken with single case logic (Eisenhardt, 1989) with a firm as the unit of analysis. The artefact isn't a software product, it's a hybrid architecture and adoption plan.

3.2 Data sources

Source	Detail	Used for
Site visits	Three visits to the corporate office and manufacturing unit, Ahmedabad	Process mapping
Management meetings	Three structured meetings: problem validation, solution scoping, prototype review	Validation of findings and scope
Design professionals	Two in-person interviews: an interior designer and an architect	Buyer-side requirements
Manufacturer staff	Discussions with production management and finance, including the CFO and Product Manager	Internal process, cost inputs
Channel contacts	Informal phone conversations with distributors, carpenters and local sellers	Distributor-side view
Benchmark visit	Greenply Industries, Ahmedabad, made as prospective customers	Reference practice
Vendor demonstration	SAP Business One demonstration	Functional fit
Secondary data	Industry literature, vendor documentation, partner rate cards	Costing, screening

The company did not provide data on distributor levels due to commercial sensitivity, and the distributor-side perspective is based on outreach to distributors.

3.3 Analysis and evaluation

To identify common issues, the notes of interviews and meetings were compared between the respondent groups (and themes were coded). A B2B portal for architects, designers and carpenters was modelled with prototype data using Figma and Rocket. It was not used to assess performance. There are no outcome measurements reported as the artefact is assessed descriptively and with scenario analysis against the requirements and management review.

3.4 Ethics and permissions

Participation was voluntary. The respondents are identified by role only and Abhiyan Group gave written permission to use operational and cost information in this paper.

IV. CASE CONTEXT AND PROBLEM DIAGNOSIS

Abhiyan's primary business is make-to-order, as well as limited standard lines production. It generates a stock and demand sample base quantity for each new design, it plans additional production based on market trends, dealer feedback, sales history and stock. Finished goods are transferred to warehouses and dispatch points, however, there is no real-time view of stock between locations. The quality of the resin from the suppliers becomes a production risk with laminate production, where kraft, decorative and overlay papers are impregnated with phenolic and melamine resins and bonded under heat and pressure.

Four challenges emerged.

Catalogue mismatch.

Sample books are a must when selling laminates. Designers reported that a design they had seen in a sample book could be discontinued, unavailable, or available only in small runs – and knowing about the availability could involve following up with salesmen or distributors. Manufacturers lose time too; about one hour to compile and/or update each catalogue, to which is added the shipment of each revision. There were also complaints by manufacturers about having to pay for online lead-generation platforms, ranging from entry leads that cost between ₹35,000 per year to verified or premium leads that cost ₹50,000 to ₹3,60,000, but have not managed to convert leads,

which are often small retail enquiries targeted at multiple competitors simultaneously at a time.

Fragmented visibility.
Local stock records are maintained and updated manually. The manufacturer does not have a real-time view, allocation and dispatch is done by manual coordination and a design may be out of stock in one region and idle in another.

Dead stock.
While batch planning helps to prevent overproduction, as the demand changes some designs end up being slow-moving or obsolete and nobody surfaces them.

Organisational readiness.
Many of the trades involve relationships, and many involve phone calls and hand-written notes. The demand for shared visibility requires distributors and sales teams to shift their thinking and working methods, and tools which don't take this into account will risk rejection even when they were successful.

V. THE ARTEFACT: ERP BACKBONE WITH AN INTERFACE LAYER

A standalone ERP rollout would incur higher costs and require Abhiyan to be ready. As it currently has a website and mobile application, we suggest putting ERP functionality behind their interface, where it is separated from the rest of the user interface, using a three-tier design (Figure 1).

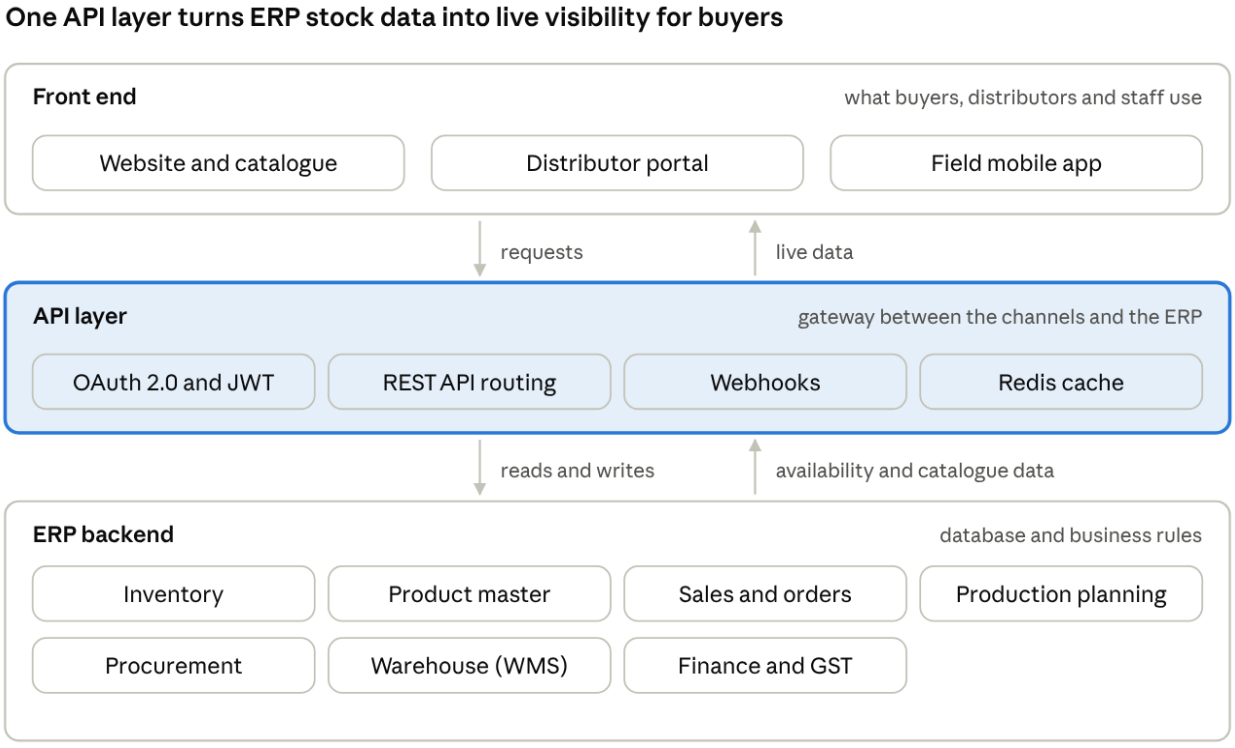


Figure 1 three-tier architecture

Figure 1. The requests are propelled down from the channels to the ERP, while the availability data is pushed up through the API layer.

- Front end: Website, distributor portal and field app display ERP data and pass requests back.
- API layer: Gateway to handle authentication, route the request to correct ERP module and send back responses. Enabling components are REST APIs, OAuth 2.0/JWT tokens, webhooks, and a Redis cache to speed the catalogue and cloud hosting.
- ERP backend: database and business rules – e.g., if a stock is not in the system, block an order, or if a distributor reaches a credit limit, block an order.

The most important thing is that the site and app display real-time ERP data, rather than a synced version.

Modules are aligned to the identified gaps. The inventory module monitors, reports on and alerts the user to replenishment, of available, reserved and in-transit stock on a SKU, per plant, per warehouse, per distributor point, and alerts slow moving SKUs. A dynamic digital catalogue, the product master drives new designs that are displayed on clearance and discontinued designs are removed automatically. The sales and order module keeps the stock reserved, checks the credit of orders, creates pick lists and dispatch schedules and keeps the buyer informed of the process at every stage.

The backbone comprises production planning, three-way matching of invoices with purchases and receiving orders, bin-level traceability in the warehouse, and a finance module that includes GST-compliant invoice.

On the website each design has one of four statuses: Available, Limited Stock, Out of Stock or Made-to-Order, and it is updated in real time as soon as a sale is confirmed. The distributor portal provides real-time stock levels, incoming deliveries, restocking requests and account statements for partners. The mobile application is for the sales reps, warehousing and delivery staff.

This was reinforced by the Greenply visit. It automatically triggers purchase requisitions at reorder point and routes the goods through the quality inspection before they appear in available stock, it only triggers the payment for three-way matching, and it shares one data source for procurement, inventory and production.

VI. ERP SELECTION: SCREENING AND SCORING

6.1 Requirements and screening

The requirements were not only based on the gaps identified during the diagnosis but also on the specific ERP functionality required such as inventory visibility, handling multi-attribute SKUs, APIs with the existing website and app, Indian GST compliance, affordability, ease of use and scalability. The best choice was cloud deployment due to the need for remote access to the distributors and web integration. These essentials (Table 1) were used as a filter and to identify the options.

Table 1: Stage 1 screening.

Option	Screening result	Reason
SAP S/4HANA; Dynamics 365 (enterprise tier)	Excluded	Scale and cost beyond Abhiyan's size and readiness
Odoo	Excluded	Laminate-specific needs (multi-attribute SKUs, batch tracking, distributor-level visibility) would require heavy third-party customisation
Lighthouse, PMTrack, Ramco, DataNote	Excluded	Limited API integration and analytics relative to the planned catalogue and ordering layer
TallyPrime, Busy	Excluded	No production planning, warehouse management or API integration
Salesforce	Excluded	A CRM, not a manufacturing ERP
SAP Business One; Oracle NetSuite	Shortlisted	Meet all must-have requirements

6.2 Weighted scoring

Twelve weighted criteria were used to score the two short listed platforms ranging from 1 to 5 (Table 2). Cost criterion was scored based on vendor positioning and partner-reported implementation scale; a NetSuite cost model was not built; thus, this score is subjective and not a calculated number.

Table 2: Stage 2 weighted scoring.

Criterion	Weight (%)	SAP B1	NetSuite
Inventory visibility	15	5	5
Cost (implementation + running)	15	4	2
SKU complexity handling	10	5	5
Integration capability	10	5	5
Ease of use	10	4	3
Scalability	10	4	5
Customisation flexibility	5	4	3
Reporting and analytics	5	4	5
Deployment flexibility	5	4	5
Implementation complexity	5	3	2

Criterion	Weight (%)	SAP B1	NetSuite
Vendor support and reliability	5	5	5
Industry fit	5	5	3
Weighted score	100	4.40	4.00

6.3 Sensitivity analysis

The weights are judgmental, so we provided re-weighted versions of both scores, scaling up other weights accordingly if a criterion was given the value of zero (Table 3).

Table 3: Sensitivity of the ranking to criterion weights.

Weighting scenario	SAP B1	NetSuite
Base case	4.40	4.00
Equal weights (8.3% each)	4.33	4.00
Cost weight set to zero	4.47	4.35
Cost and industry fit both set to zero	4.44	4.44
Scalability, reporting and deployment weights doubled	4.33	4.17

SAP Business One dominates in all the scenarios except one where it is tied. The two factors which determine the ranking are cost sensitivity and the need for fit in the sector, not the other ten. For larger, or multinational organisations, scalability, analytics and multi-site operation are most critical strengths of NetSuite – and would prove to be the difference for Abhiyan should it grow beyond its current size. A vendor demonstration of SAP Business One validated multi-attribute SKU configuration, integration with REST API, and scalability and pre-configured GST handling (SAP, n.d.).

The screening in Table 1 is based on the authors' review of vendor documentation and market information and is not based on demonstrations or independent scoring of all the options. We will delve back into this in Section 10.

VII. COST ANALYSIS

The model is a bottom-up, 3-year total cost of ownership (TCO) for SAP Business One on cloud subscription. The number of users was defined by department heads: 8 professional users and 14 limited users (4 finance, 7 logistics and 3 CRM). The partner Indian SAPs charge the following rates (conservative against the general range of 10–40% discount on the partner rates) for Licence: ₹7,500 per professional and ₹2,378 per limited user per month. Implementation includes requirements mapping, configuration (60 consultant days at ₹8,000), migration of over 5,000 SKUs and distributor and customer records, testing and go-live support. Customisation includes the inventory visibility and catalogue modules, the buyer and distributor portal, the GST and WhatsApp/SMS integrations, batch production add-on and dead-stock dashboards.

Table 4: Three-year TCO, SAP Business One (cloud). Year 1 ≈ ₹34.66 lakh; Years 2 and 3 ≈ ₹14.18 lakh each.

Component	3-year total (₹ lakh)
Licenses (cloud subscription)	28.55
Implementation	10.55
Training	1.50
Customisation and add-ons	7.40
Cloud infrastructure (hosting, internet, VPN, setup)	5.52
Support, enhancements, refresher training	6.50
Contingency (5%)	3.00
Total	63.02

Costs are upfront with most spent in Year 1, for implementation and customisation. The largest line are licences and value must be provided annually. Cloud hosting also costs less than an on-premise solution (₹5.52 lakh for three years, versus ₹7.28 lakh for three years) and it's also necessary because the distributor portal needs to be accessible from the outside.

VIII. EVALUATION AND DISCUSSION

8.1 Assessment of the propositions

Table 5: Propositions and evidence.

Proposition	Evidence in this study	Status
P1: availability uncertainty suppresses conversion	Designers report chasing representatives to confirm availability; catalogue and stock diverge	Consistent with qualitative evidence; conversion not measured

Proposition	Evidence in this study	Status
P2: regional stock-outs coexist with slow movers	Manufacturer interviews describe designs out of stock in one region and idle in another; no stock-level data were shared	Consistent with qualitative evidence; not verified against stock data
P3: ERP pays off only with an external layer and staged adoption	Standard ERP integrates internal data but does not by itself expose availability; adoption risk documented in the literature	Argued from design and literature; to be tested in a pilot

8.2 Before and after

The difference between the current flow and the proposed current flow is shown in figure 2.

Order confirmation on the phone is superseded by instant stock checks, by an automatic rather than manual update to the catalogue, by an unstructured picking system by a system-generated pick list and by unseen slow movers by ageing alerts.

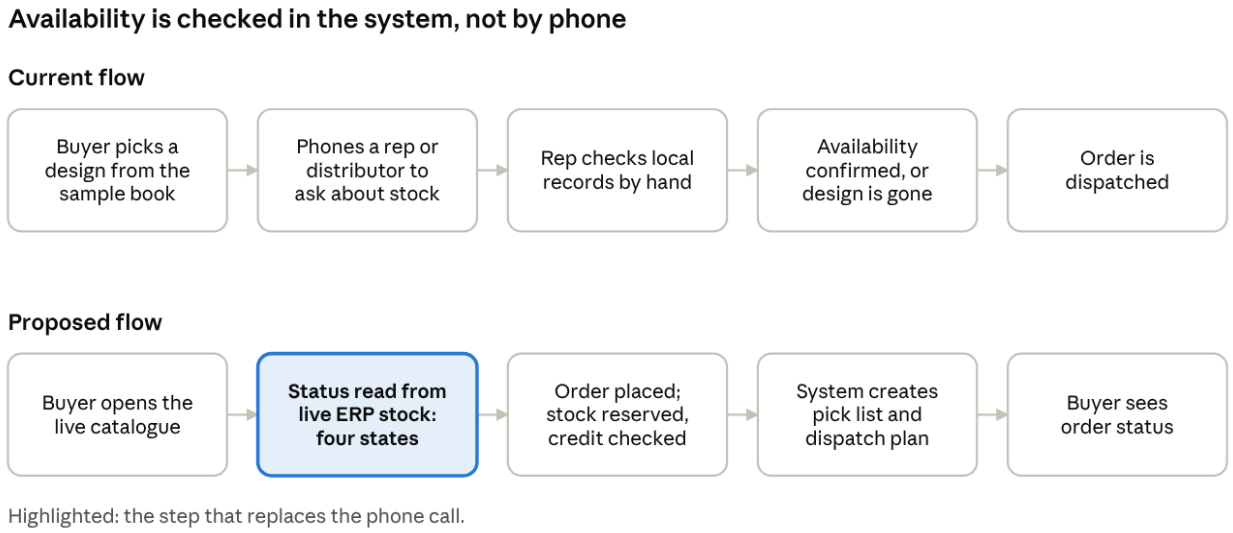


Figure 2 current vs proposed flow

Figure 2. Current flow (top) and proposed flow (bottom) with the highlighted step being the phone call being replaced. The anticipated benefits include reduced catalogue prices, reduced coordination labour, quicker fulfillment and improved working capital utilization. These are not quantified and there is no payback period claimed.

8.3 Where the value sits

Licenses at ₹28.55 lakh provide generic functionality whereas the customisation line at ₹7.40 lakh is directly related to the diagnosed gaps. Therefore, the case for the investment is made not on the basis of standard modules but problem-specific integration, in line with the notion that ERP value is dependent on the way it is applied to the organisation (Davenport, 1998; Gattiker and Goodhue, 2005).

8.4 Contribution

The results complement the ERP literature, which focuses on the need for internal integration, with a focus on exposing ERP data to channel partners, and a connection to adoption theory (Venkatesh et al., 2003). As a practice, they recommend design-led, multi-tier businesses to indicate the layer of external visibility as part of the ERP business case, rather than as an additional add-on.

IX. IMPLEMENTATION ROADMAP

As ERP projects have a poor track record of getting adopted and rolling out change management, we suggest three phases in line with management's commitment to building inventory visibility and

catalogue automation first, instead of other phases of the project.

1. Foundation. Pass all the SKU's, plant and warehouse stock into ERP system and enable the sales module to ensure all orders are passed through one system.
2. Operations. Coordinate production plan and procurement; supply as per demand and reorder raw materials at planned levels.
3. External layer. When data are reliably available, extend ERP to website, digital catalogue, distributor portal and mobile app.

Training should be staged and practical and demonstrate to staff how this system saves them follow-up calls and manual checks. Errors must be cleaned out of the data before it is moved otherwise, they will be carried forward through an integrated system and management support and feedback loops are critical.

X. LIMITATIONS AND FUTURE RESEARCH

It is a study of only one firm, drawn from a small qualitative sample size and cannot be generalized without replication. Data from the distributors were unavailable. The prototype was not evaluated with live users, and was not tested with actual data, making the evaluation purely analytical, similar to other tests conducted in the initial testing phase. The weighted scoring compares and ranks two platforms with judgmental weights; screening of other options is based on authors' judgement; the NetSuite cost score is a judgement without a cost model. Cost inputs include rates for partner listing, not negotiated rates.

Future work should (i) trial the interface with a sub-set of distributors and measure the costs of catalogues, order-cycle time, stock-out incidence and dead-stock value; (ii) score additional platforms on the constructs in Venkatesh et al. (2003); (iii) code interview data systematically (Braun and Clarke, 2006) from a larger and wider range of respondent set in other design-led categories (such as tiles, sanitaryware); (iv) elicit criterion weights from an expert panel; and (v) test P1–P3 in other design-led categories.

XI. CONCLUSION

Abhiyan Laminates is not facing an inventory problem, it's an information problem. Stock is distributed between plants, stock houses and distributors, but no one can see it, distributors cannot re-distribute it and the company can't act in advance of it being dead stock. While a cloud ERP is essential to the backbone, for most weighting the answer lies with SAP Business One's scale and budget, but it is the interface layer that transforms internal data into external visibility in real time that gets to the heart of the problem. Human implementation risk is the greatest and platform selection should be accompanied by training, simplicity and management commitment. The suggestions put forward here are testable and the next step will be a pilot to assess their impact.

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