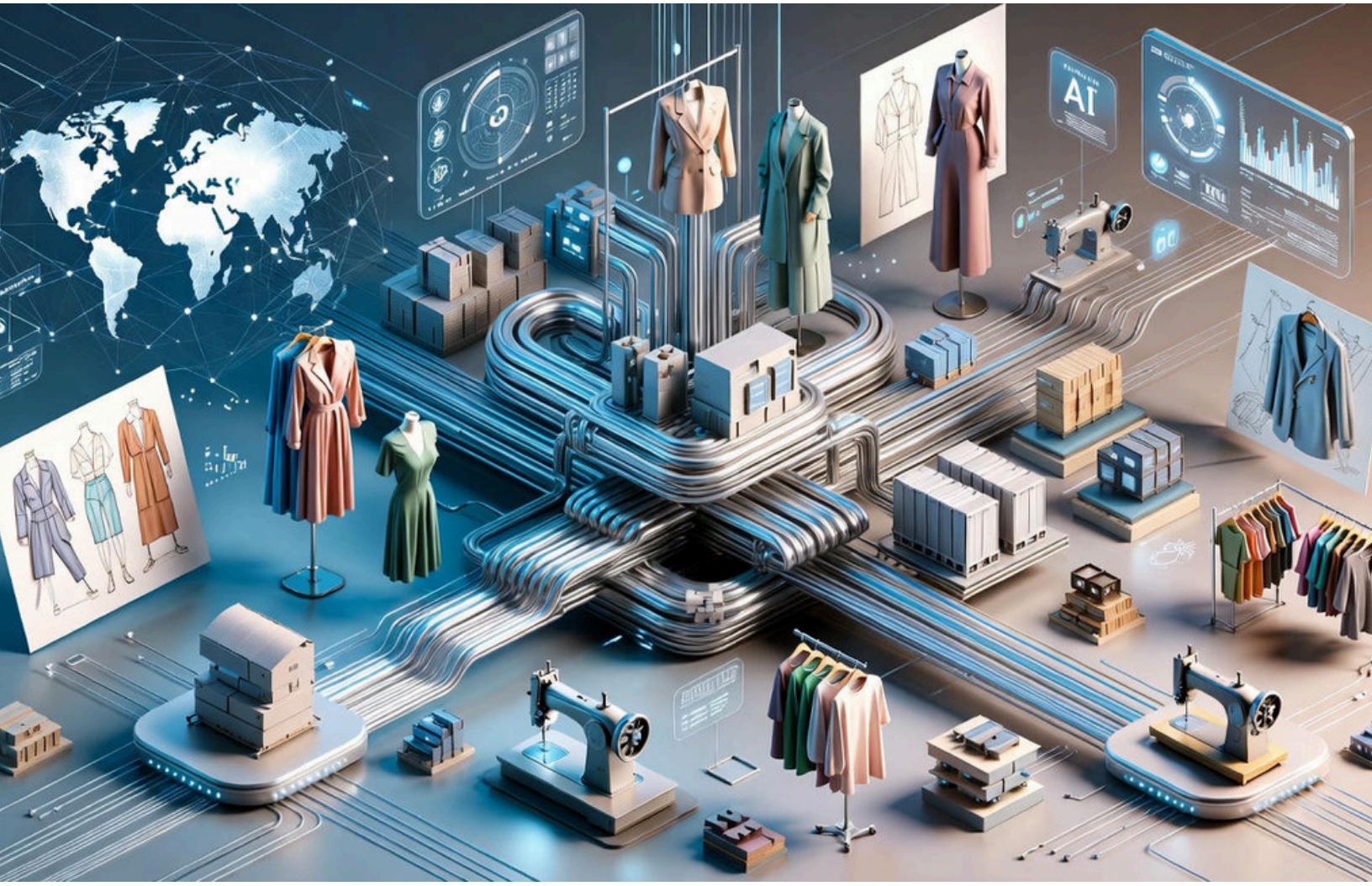
Designing Supply Chains That Work in Uncertainty

An in-depth conversation with Paul Lennen and Ahmed Zaidi, featured on The Sourcing Exchange



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The Structural Flaw: An Invented Fragility

Fashion's global supply chains operate under conditions of extreme instability—a balance defined by volatile demand swings, relentlessly squeezed margins, and the constant tension between the need for speed and the demand for responsible practice. For Ahmed Zaidi, CEO of Hyran Technologies, a mathematician by training, and an academic formerly based at the University of Cambridge, this instability is not merely an operational mishap; it is fundamentally structural. It is deeply rooted in the history of the industry and driven by perverse incentives that inherently place brands and suppliers in opposition. The prevailing business model, he argues, is engineered to underperform when subjected to stress.

Ahmed's personal history offers a compelling connection to this systemic failure. His family represents three generations of garment manufacturers based in Pakistan. This deep history positioned them directly within the impact zone of the 2008 global financial crisis, during which their business nearly failed as numerous major buying partners defaulted entirely on payments. He recounts that many of those defaulting customers simply ceased to exist, leaving a significant financial void. Given that legal protections like limited liability were often ineffective in that region, Ahmed's family found themselves heavily indebted to their own raw material suppliers.

At the young age of 16, Ahmed was required to step into the role of negotiator, mediating with creditors to secure a relative's release and structure a payment plan. This experience provided a direct, firsthand understanding of precisely how risk, power, and ultimately, human dignity, are distributed within the global fashion supply chain. The encounter was so formative that Ahmed initially decided never to return to the industry, yet that very experience became the foundational, quantitative question of his career: Why is this business model fundamentally built to fail?

The Historical Roots of a Fragile System

Ahmed's academic journey, culminating in a PhD and lecturing position at Cambridge, provided the lens through which to dissect this structural issue. His later involvement in a UN white paper focused on developing sustainable business models pulled him back into the fashion world, confirming his suspicion that a quantitative approach could expose the core inefficiencies. He asserts that true sustainability transcends simple carbon counting; it demands financial resilience and the establishment of a foundational level of dignity through equitable partnerships.

The current systemic issue, he explains, traces its origins not to mechanisation, but to a seemingly innocuous 19th-century innovation: the standardisation of sizing. This breakthrough allowed companies to create inventory on a mass scale, permitting them to "bucket" products and place an enormous, speculative "bet" on consumer demand months or even a year in advance. This standardisation, while enabling mass production, simultaneously birthed the industry's reliance on speculative forecasting and its inherent exposure to risk.

Because this long-term speculative bet is frequently wrong—a near certainty in the apparel business given shifting consumer tastes and rapid trend cycles—a mechanism was required to offload the inevitable risk of surplus inventory. That mechanism was the ubiquitous discount. To afford the inevitable clearances and markdowns, brands developed the tactic of building extra margin into the original buying price, which in turn necessitated the relentless squeezing of costs from the manufacturers. This created a vicious cycle, pushing the financial burden, the inventory risk, and often the human cost onto the most vulnerable party: the supplier. The historical analogy Ahmed cites is compelling: early labour riots in places like East London were a direct result of this inventory-driven risk transfer and the corresponding downward pressure on wages.

The advent of globalisation provided the second key feature of this fragile system: financial arbitrage. Pioneers like Nike demonstrated the massive profit potential in buying cheaply from manufacturers in emerging economies (such as Japan initially, and later Southeast Asia) and selling at a premium in Western markets. Crucially, globalisation served to "export the problem," moving the social consequences—like the labour issues of the 1800s—out of the brand's home "backyard." While seemingly efficient, this model of financial arbitrage, built upon the foundation of inventory risk and cost-squeezing, simply deferred the systemic failure. Today, the convergence of factors like increasingly higher Minimum Order Quantities (MOQs), crippling interest on stored inventory, escalating logistics costs, and the complexity of new tariffs means that relying on low manufacturing costs alone is wholly insufficient to mitigate the inherent risk. Even at what seem like "rock bottom prices" in manufacturing hubs, the risk premium demanded by volatility is too high, signalling that the entire structure is now prone to a catastrophic breakdown.

The Antagonism of Misaligned Incentives

Ahmed pinpoints the constant state of mistrust as the human barrier that reinforces the structural fragility. The relationship between buyers and suppliers is fundamentally antagonistic because neither side fully understands or trusts the other's incentives.

Buyers operate under the assumption that manufacturers are strategically withholding true production costs or inflated margin figures—a belief rooted in the historical necessity of manufacturers to build their own buffers against sudden cancellations. Conversely, suppliers believe that buyers are purely focused on "squeezing them for every margin" and will ruthlessly exploit any shared vulnerability—including a factory's genuine, maximum production capacity, or an estimate of their raw material costs—for commercial gain. This environment compels both parties to withhold crucial information, creating a constant state of internal "hedging" that actively erodes the potential for necessary, high-value collaboration. The practical result of this mutual suspicion is layered, duplicated risk, contributing directly to the endemic overproduction that plagues the industry. Ahmed argues passionately that the core objective must be to develop a new system of incentives that allows both brands and suppliers to thrive simultaneously, moving from a zero-sum game to one based on shared value.

The Illusion of Prediction: The Futility of Long-Term Forecasting

In their attempt to tame the industry's pervasive volatility, many global brands are making massive investments in AI and big data, hoping to achieve better, more precise, and longer-term sales forecasting. Ahmed, a mathematician who has studied this quantitative problem rigorously, dismisses this approach as misplaced effort and a fundamental misunderstanding of the technology's true utility. His assertion is simple: You cannot predict the future with the precision the industry demands. No algorithm, regardless of the sophistication of its training data or the power of its hardware, can reliably forecast consumer taste 18 months in advance. The current focus on predictive technology is, therefore, a strategic diversion from the true solution.

Ahmed uses an elegant and powerful analogy to illustrate this futility. He points to the celebrated weather model developed by Google DeepMind. Weather is a physical phenomenon governed by robust, well-understood physics, and the model is built upon a massive, dense historical data set, utilising immense compute power. Yet, DeepMind only "brags" about reliable accuracy 15 days out. Ahmed poses the definitive question: if a model built on certainty, physics, and boundless resources can only achieve two weeks of reliable prediction, how can the fashion industry, dealing with the fickle "science" of human behaviour and cognition, confidently claim accurate foresight 12 to 18 months ahead? The consumer's final purchase decision—walking into a store, holding a garment, testing the fit—involves a complex emotional and situational calculus for which "there are no axioms," making any long-term forecast a guess masquerading as science.

The problem, he argues, is not the forecast itself, but the worship of the forecast. The industry takes what is inherently an approximation—a mere guide—and treats it as a precision decision, hard-coding it into monolithic planning systems like Material Requirements Planning (MRP). This structure requires a single, definitive number that cascades through the entire upstream supply chain, driving raw material buys, capacity planning, and long-term financial commitments. This worship creates an inflexible supply chain that is fundamentally fragile: the moment the market deviates from the projected number, the entire system seizes up, leading to panic buying, cancellations, and the creation of massive unsold inventory. Ahmed notes that a slightly improved forecast, even if proven 98% accurate, still fails to address the root issue of catastrophic failure caused by the small percentage of error. He prefers the philosophy: "I'd rather be approximately right than precisely wrong." The required philosophical shift is to move away from demanding certainty and toward designing a system capable of coping with the certainty of uncertainty.

Toward Anti-Fragile Systems: Optimisation as the True AI Promise

The required philosophical and operational alternative is the concept of anti-fragility, a term popularised by philosopher-trader Nassim Nicholas Taleb. Anti-fragile systems are those that do not merely survive a shock, but actively benefit from disorder, stress, and volatility. The fashion supply chain must accept uncertainty as its default operating condition and be designed to thrive within it.

The Mechanism: Scalable Postponement and Multi-Dimensional Decision-Making

The core operational mechanism for achieving anti-fragility is agility, primarily driven by postponement. This strategy mandates delaying irreversible, costly steps—such as dyeing fabric or cutting garment pieces—until the latest possible moment in the production cycle. By postponing commitment, the manufacturer moves closer to the point of sale, allowing market signals to become clearer and forecast uncertainty to decrease dramatically before major investment is made. Postponement allows the brand to commit to high-risk product features only when it has the highest possible confidence in demand. While the concept of postponement is known, Ahmed notes that few companies execute it in a truly scalable or systematic way, usually limiting it to one or two fabrics or a handful of trusted suppliers.

The bottleneck to scalability is the overwhelming challenge of multi-dimensional decision-making. Executing postponement requires calculating the optimal inventory holding point by simultaneously balancing a sprawling matrix of constraints: thousands of SKUs, varying market volatility across different geographies, multiple supplier-specific lead times, fluctuating MOQs, real-time logistics costs, interest on holding materials, and the environmental (CO2) impact of various choices. For example, a buyer must assess if the cost saving from a high MOQ order placed 12 months out is worth the high interest and markdown risk, versus a smaller, faster order placed 3 months out. This complex, high-dimensional math is simply beyond the capacity of humans using traditional tools like spreadsheets, which must inevitably oversimplify the variables (e.g., using a single average lead time), thereby reintroducing fragility.

Optimisation Versus Prediction

Here, Ahmed argues, lies the true, often ignored, promise of AI: optimisation. He is obsessed with finding the optimal route given the finite, constrained information available. Unlike prediction, which attempts to guess an unknowable future outcome, optimisation uses known constraints to calculate the best possible strategic path. This approach is superior because it is provable: the model compares the proposed route against all other feasible routes, providing a clear, evidence-based direction. Ahmed emphasises that AI's role is not to replace the human eye in design or the human intuition in forecasting, but to solve the "travelling salesman problem" of the supply chain—the complex math of trade-offs. The algorithms can model trade-offs—such as reducing lead time by accepting a slightly higher fabric cost, or shifting production to a lower CO2 country despite a longer transit time—allowing human teams to select the most strategically sound and feasible path, rather than clinging to a hopeful, precise forecast. This focus on optimisation is the key to creating a system that thrives on making the best possible decision under conditions of imperfect knowledge.

Zero-Delay Decision-Making: The End State of Sourcing

The full realisation of the anti-fragile vision depends entirely on bringing the cost of information down to zero. Ahmed envisions a revolutionary future where brands are digitally and seamlessly connected to their entire supply chain, from Tier 1 manufacturers all the way down to the spinning mills. In this state, a designer or merchandiser could tweak a quantity, change a colourway, or swap a fabric and instantly, in seconds, receive a complete holistic cost of ownership impact analysis. This analysis would pull forward the future externalities of the decision: the precise change in lead time, the total financial cost, the resulting CO2 footprint, the probability of future replenishment, and the net impact on profitability.

This instantaneous feedback loop eliminates the debilitating information lead time that currently defines the industry. Today, getting a cost and lead time confirmation for a complex order or a change request requires weeks of emails and manual re-planning across multiple functions within the factory (from knitting to finishing). Ahmed points out that with an optimisation engine, this laborious process—which can take a week even at best-in-class factories—is reduced to a second. This speed allows for 100 times more scenario planning than is possible today.

The transformation is comprehensive, extending across all function

1. **Design and Merchandising**: Teams shift from guessing to strategic scenario planning. They can explore hundreds of viable combinations, optimising material and colour choices not just on aesthetics, but on net profitability and risk mitigation. For example, a designer changing a colour choice would instantly see that the new pigment requires a different, slower lab-dip approval process, adding three weeks to the critical path—a complexity that is currently hidden until chaos erupts.
2. **Sourcing and Supply Planning**: These roles pivot from guessing and constant operational firefighting (expediting materials, managing delays, troubleshooting) to becoming highly strategic. They are freed to focus on high-value activities like defining global sourcing strategies, managing long-term risk, and setting up adaptive networks. Ahmed laments that today, supply planners often spend 24/7 simply trying to ensure materials are available for orders that get pulled forward—a wasteful, operational loop that would be solved by real-time planning.
3. **Manufacturing Execution and Machine-Level Planning:** The technology extends down to the factory floor, enabling machine-level planning in real time. This means the brand knows exactly when their yarn will be spun, when it will be converted to fabric, and the precise moment their order will finish. This visibility addresses one of the major causes of delay: reprocessing. By knowing, for example, the optimal Grams per Square Metre (GSM) for a fabric based on the chemical load of a specific dark dye, the machine can be set to minimise the chance of rejection and expensive reprocessing. This transparency ensures that capacity is optimally used and provides instant alerts if production deviates from the agreed-upon plan.

The result is a supply chain management approach that moves from reaction to strategic exploration, fundamentally changing the management of the business by making strategic, multi-dimensional decisions routine.

Culture and Accountability: The Human Component of Change

While Ahmed sees the core underlying technology largely existing, he stresses that the real barrier is cultural and procedural. Decades of embedded adversarial behaviour make the open, data-sharing environment necessary for effective optimisation—and necessary for trust—incredibly difficult to implement. Ahmed concludes that culture, not code, is the most formidable obstacle to change.

He is also firm that technology should serve to augment human judgment, not replace it. Algorithms are highly effective at exposing the complex, multi-objective trade-offs—for instance, between price, speed, and CO2 footprint. However, the human is essential for setting the strategic and moral priorities. In a multi-polar world, the weights assigned to objectives like cost, speed, and carbon will fluctuate month-to-month and brand-to-brand, requiring human strategic guidance. Furthermore, accountability and ethics can never be delegated to software. Ahmed argues that a human will always remain in the loop, responsible for reviewing the optimised plan before the final production is booked, ensuring that decisions align with the brand's values and legal obligations. The factory manager or production executive must review the machine-level plan and confirm, "Yes, I'm good with that."

This perspective extends to the broader social impact of AI. Ahmed notes the universal fear of job obsolescence among his computer science students, a fear mirrored across the fashion supply chain. He offers a historical perspective: every technological junction—from the invention of the printing press to the industrial computer—eliminates old roles but simultaneously births an enormous volume of new ones (programmers, technicians, AI ethicists). The responsibility, Ahmed maintains, lies with the companies who benefit from AI: they must commit to reinvesting a percentage of their efficiency gains into retraining and upskilling employees who have lost their jobs to automation, ensuring that the transition is humane, not purely extractive.

The ultimate goal of anti-fragility is therefore as much moral as it is operational. It requires the industry to adopt a humility that admits its inability to know the future, an honesty about incentive conflicts, and the courage to design systems that genuinely share risk. This framework offers a path where suppliers gain dignity and transparency, and brands shift from an outdated command-and-control model to one of adaptive orchestration. "It's not about perfection," Ahmed affirms. "It's about building a system that thrives even when we're wrong." The lesson is universal: the winners in an increasingly volatile global economy will be those who develop the most collaborative networks and the most adaptive, optimisation-driven tools. Anti-fragile supply chains, connected and grounded in trust, are the key to not just surviving uncertainty, but to generating growth from it.

Conclusion: Redefining Resilience and Partnership

Designing supply chains that work in uncertainty requires companies to accept instability as normal, information as instantly shareable, and collaboration as the default mode of business. In doing so, they unlock adaptability at every level—from design to delivery, from data scientists to factory workers.

The transformation outlined is comprehensive, moving the industry toward a model where the cost of information is zero and human roles shift from firefighting to strategic thinking. By focusing on optimisation and planning down to the machine level, operations become agile and resilient, eliminating the adversarial relationships that plague the supply chain today.

Anti-fragility is not a technology; it is a mindset. It values experimentation, shared learning, and transparent partnership. The brands and manufacturers that embody these principles will not fear disruption; they will feed on it. Uncertainty, in the end, is where the future hides. Those who learn to operate comfortably within it will not merely endure change—they will shape it.