

A Digital Planning Twin with Prescriptive Analytics: The Key to Driving Value in S&OP

Learn why running prescriptive analyses on a digital planning twin of the end-to-end value chain drives unmatched value, process efficiencies, and transformation for S&OP.

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Introduction

Gartner defines S&OP Systems of Differentiation as having 13 key technology capabilities, and supply chain modeling is one of these crucial components. Over the last several years, we've come to see that supply chain modeling is not only crucial for S&OP, but it is essential to nearly every other area of supply chain planning — whether that be short-, mid-, or long-term planning.

Supply chain modeling has been around for quite some time, but in recent years we've seen the rise of the term "supply chain digital twin." Simply understood, it is a digital representation of a company's supply chain. However, these **digital supply chain twins often don't represent supply chains, much less business, to an exact or real-world level. Thus, simulating or analyzing scenarios on top of digital supply chain twins yields limited value.**

In this brief, we expand upon the concept that S&OP only requires a digital supply chain twin, a digital twin that powered by a limited model using heuristics or data cubes. Instead, we make the argument that, in order to see the most value from decision-making, companies must utilize a digital version of their end-to-end business — a model or series of models that integrates finance and operations. This is what we refer to as a digital planning twin. Only when leveraging a digital planning twin (DPT) paired with prescriptive analytics for forward-looking scenario analysis can companies experience the full value potential from S&OP- and supply-chain-related decisions.



Limitations of Existing Software Applications

Rules-Based Solutions Create Inefficient, Underperforming Plans

An S&OP application that relies on a rules – or OLAP-based – model underneath will help balance supply and demand in simple situations where there are very few constraints (for example: in a completely outsourced manufacturing environment where there are no assets). Many S&OP solutions on the market fit into this category.

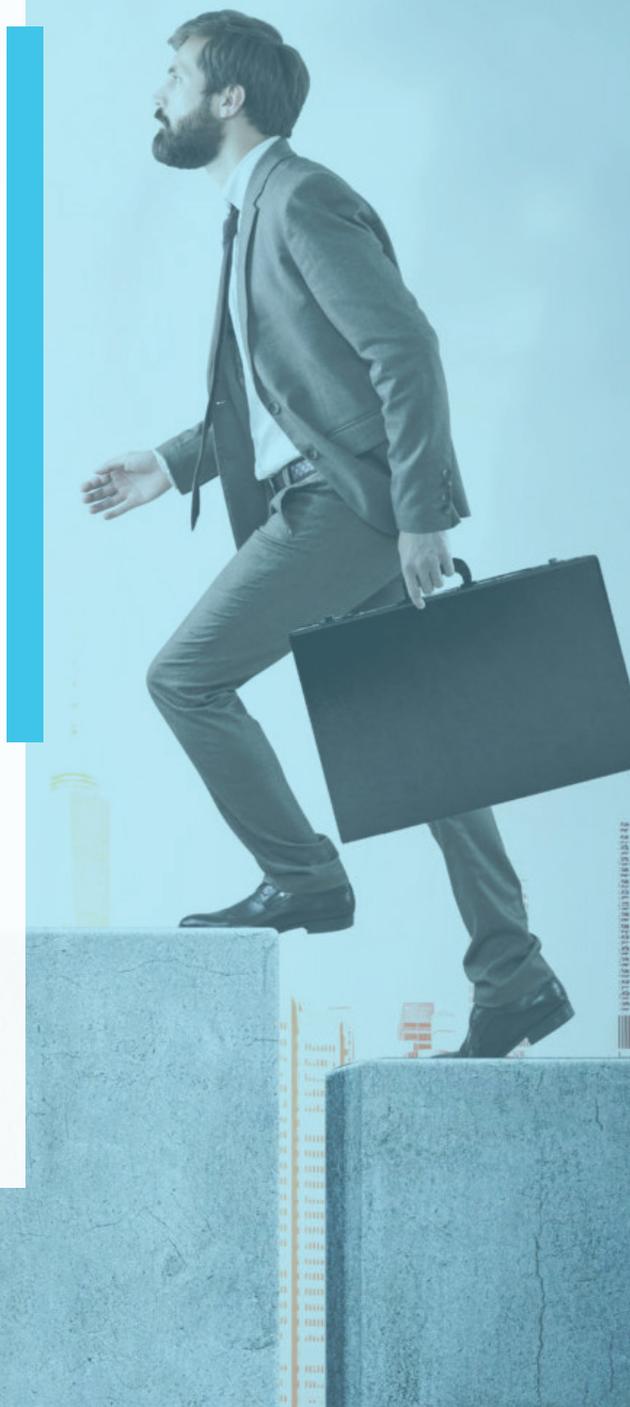
In more complex organizations, rules-based approaches actually detract from value by creating infeasible plans that companies mistakenly believe are achievable. Even worse, rules-based approaches create misconceptions about **the real drivers of performance, thus often leading organizations to pursue strategies that destroy value.** For example, if certain constraints are not represented or respected during the S&OP process, (as is almost always the case with purely rules-based planning solutions) plans are often not even executable on the ground (“in real life”). The resulting inefficiencies, lack of confidence and sub-par performance metrics can be hugely detrimental to the S&OP process.



Using Rules in Planning: Real-Life Examples

Take a major consumer goods manufacturer as an example. The company used rules-based tools to support their S&OP decisions, including production sourcing, product allocation, build-ahead, etc. As is typical with this approach, the rules determined available capacity by allocating production to plants and specific production lines. Thus, when a given line appeared full, the rules would assign additional volumes to the next line. Rules that allocate production typically ignore labor availability, critical constraints such as tie-lines and product mix/throughput ratios, raw material cost fluctuations, supplier volume discounts, etc.

From a capacity standpoint, this approach would typically under-utilize capacity, as it would most likely miss opportunities to maximize throughput. Furthermore, it would also miss critical constraints that may cause it to over-estimate capacity available (i.e., labor availability or a product mix that impacts throughput). When further considering product demand fluctuations and plant maintenance/shift schedules, it is easy to see that rules-based approaches will either over-estimate capacity (leading to potential production shortfalls later on), or miss opportunity for the best use of resources (i.e., lowest cost, most profitable, etc.). **This type of approach is not sufficient for companies looking to build long-term resilient supply chains that continue to perform optimally despite unexpected market dynamics.** The main reason for this is that rules-based approaches are based on a hypothesis of how the system should work that ignores important constraints, and does not take into account how changes in key variables such as demand affect this hypothesis. While this can also be the case with optimization approaches, it is commonplace when using rules.



This is a minor point compared to the broader impact on performance, however. Rules fire sequentially – first production, then inventory, then logistics, and so on as they try to meet demand. Due to the sequential nature, there is no ability to balance or optimize trade-offs, for example between production sourcing, raw material costs, and transportation (there are many more, including labor, promotions, inventory, etc.). This means rules-based approaches will produce a product that is more expensive to make, or might incur a higher transportation cost than necessary. This could be fine in certain situations but could have major unforeseen negative impacts in more complex situations. Just as important, if a rules-based approach is used as an input to tally up financial expectations, then managers will have an incorrect perception of costs and profitability. This can cause them to unknowingly pursue strategies that may destroy value.

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Companies like PepsiCo are all working on moving from the traditional descriptive and diagnostic analytic capabilities to prescriptive analytics. Adopting prescriptive is critical for supply chains to gain a competitive advantage now and in the future. I firmly believe driving visibility and end-to-end optimization in the supply chain is the single biggest opportunity for transformation within a business or enterprise.

— SVP Supply Chain at Advance Auto Parts and Former SVP Supply Chain at Frito-Lay, Leslie Keating



Why Companies Still Rely on Rules-Based Planning

So why is it that most companies rely on rules-based solutions? Unfortunately, it often has to do with either lack of knowledge in the marketplace or accepting “good enough” responses versus highly data-driven, valuable responses.

Rules-based systems oversimplify reality, which is why they have historically been able to deliver faster plans and support more agile decision-making than optimization-based solutions. There is still the myth in supply chain circles that optimization solutions are hard to implement and total black boxes. While most optimization vendors today function the way they did 30+ years ago — failing to keep up with the ever-changing needs of end users — there are solutions on the market that support fast, agile decision-making. Companies have prioritized fast planning over better decisions and stronger insights for too long, thinking it had to be one or the other. That is simply no longer the case.

If supply chain/S&OP wants a seat at the table alongside financial/budget and strategy planning in order to elevate its role in the organization, then it needs to bring more compelling insights. Those necessary insights are not just limited to financials. S&OP must have a view into how their decisions support/impact both the strategic and financial plans, as well as insight into how pricing might be modified, defining which promotions should be run and when, what new products should be brought to market, etc. If S&OP can provide insight into some of those questions, it will become the most critical tactical planning process in any company.

“...It’s very powerful to be able to efficiently represent and solve business problems as genuine optimization problems with an objective function, constraints and choice variables...Decisions that were previously judgement calls or based on experience can now be made on the basis of data, and are therefore infinitely more valuable to business objectives. Given the complexity of modern decision making, if firms are not employing genuine optimization, there’s no chance they’re doing the best they can...”

— Simon Avenell, Partner,
PWC Australia

Best-in-Class S&OP Is Brought to Life with a Digital Planning Twin

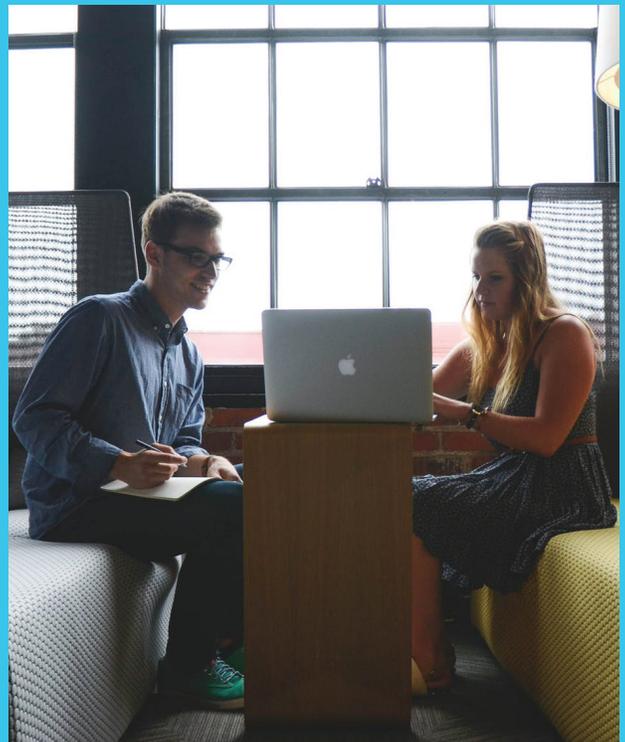
Defining a Digital Planning Twin (DPT)

As we previously said, a digital planning twin is key to turning S&OP into a top value-driver for the business. The digital planning twin is a realistic, digital representation of how a business works — including how it incurs revenue and cost. Just as the business or market shifts, so does the digital planning twin. It is an accurate replica of the business for planning purposes. Then, when prescriptive analytics is applied to the DPT, one can clearly see the best ways to meet all key objectives while respecting important cross-functional limitations. Due to the digitized nature of the digital planning twin, it can be easily queried by business users for “what-if” analyses. It also encourages seamless collaboration around scenario analysis and planning across business functions, as long as the appropriate prescriptive reports are generated. A major differentiator is that a digital planning twin is specific to an organization; it’s not a generic application data model that retrofits an organization into a standard model.

Digital planning twins allow companies to digitize their organization and answer the question of “How can I best run my business within the many operational, financial, and strategic constraints?”

A digital planning twin is defined by having the ability to:

- ✓ Accurately represent all key aspects of the business (e.g., baseline demand, demand optionality, product mix, manufacturing, distribution, warehousing, and stocking).
- ✓ Represent cost accounting associated with the value chain (e.g., revenue, discounts/promotions, fixed and variable costs, marginal contribution and opportunity costs).
- ✓ Represent the forward-looking chart of accounts (e.g., P&L, balance sheet and cash flow).
- ✓ Represent the key constraints of the business whether physical (i.e. capacity, throughput), financial (i.e. cash flow, working capital), policy (i.e. stocking, sustainability) or market driven (i.e. upside demand).





Using a digital planning twin has a seemingly magical ability to bring stakeholders from all over a business to discuss and agree on how their business should be modelled. It's scary when marketing, finance and operations teams are unaware of each other's accountabilities — but it still happens. The throughput KPIs of operations teams does not align with the ROI requirements for finance, hence it is impossible to maximize profitability and growth of a business. Because operational activities can be mapped to financial implications, Digital planning twinning allows clients to embark on a journey to generate solutions to problems that have a global optimum.

— Matthew Birch,
Manager, PwC



Solving the Biggest S&OP Challenges with a Digital Planning Twin and Prescriptive Analytics



Making decisions in a constrained supply environment

In situations where demand exceeds capacity – where there are supplier, manufacturing or distribution constraints — a company's value is driven by its ability to maximize the use of resources. Therefore, at a minimum, the digital planning twin must contain the following business information:

- ❑ What are the alternative uses of each asset? For example, a production line could potentially produce more than one product.
- ❑ Which factors drive decisions on how to use the asset? For example, in an environment where it is imperative to meet demand, throughput and lead-time to market are key considerations. If the goal were to meet demand while maximizing profit (or minimizing cost), then the model would need to consider profit per hour of a constrained resource as a key decision variable.
- ❑ Are there additional factors that might impact decisions on the use of scarce resources? In a situation where meeting demand is the only priority, the only consideration might be other constraints, such as inventory capacity in the warehouses or raw material availability at different locations. However, if there are multiple objectives – such as meeting specific financial KPIs – then it is likely the company should be evaluating whether all products/ customers are profitable. In the latter scenario, it might be better to run at a lower utilization.

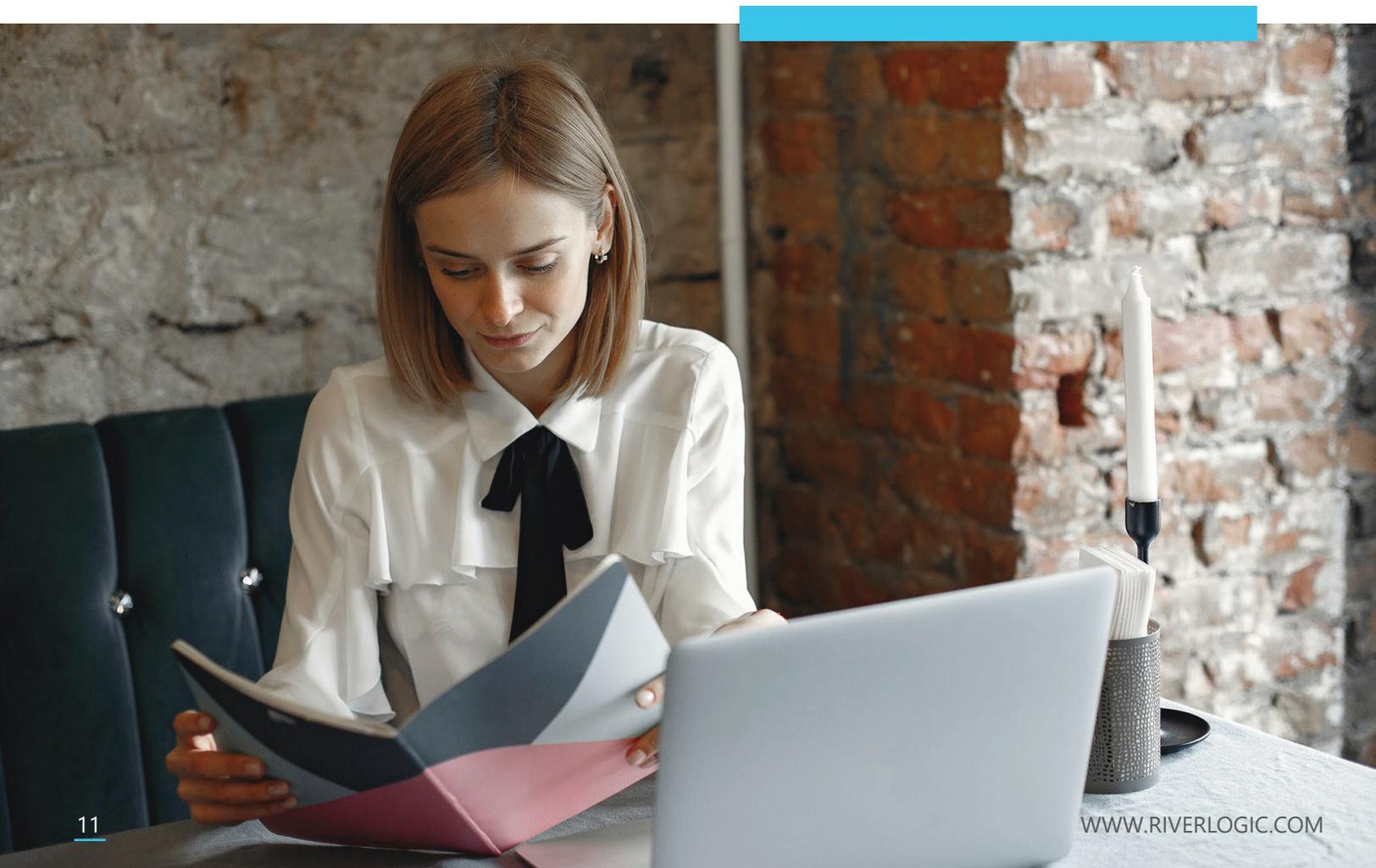


Making decisions in a push environment

Now let's imagine we are in a production-led environment, like one that's prevalent in the resources sector (oil & gas, mining, agriculture, etc.). In these situations, a company plans a certain amount of production, including assumptions about the grade or quality of the product they will produce. They then sell a portion of their estimated production as long-term contracts, and the rest in short-term or spot contracts. Planning typically starts with production, then commercials & logistics, and finally a financial tally.

In push environments, maximizing the value of the product while simultaneously minimizing costs is the key driver of shareholder value. A digital planning twin is required to drive this value by answering important questions such as:

- When planning production, what should we do with the product? The most simplistic approach is to sell everything as is produced, but that typically leaves significant money on the table. So, the important questions here are how to process, refine, or blend the products to meet market need or, even better, to maximize profitability. For example, Mining companies must decide how much to process their products as they come out of the mines, and whether they should blend it with existing stock piles (at the mine, rail, port or customer location) to meet certain grade specifications. These decisions impact product grade but also the cost to transport/deliver products; therefore, the profitability of the operation is also affected.
- In the tactical 90–270 day window, how do I maximize profit given production schedules and existing contracts? Here the company must make multiple decisions at once, including how much transportation capacity it needs to secure (pipelines, barges, trains, ships), where to send what products, and whether to deliver on a contract early or late (and incur penalties). The most advanced companies also utilize the digital planning twin to help them identify profitable arbitrage decisions, whereby they increase profits by purchasing a third-party product to fulfill an existing contract while selling their own product elsewhere.
- More complex scenarios would also require a digital planning twin to consider product price curves, exchange rates, and so on when making integrated planning decisions about their business.
- Above are just two of many examples where S&OP could become (and has already in some companies) an integral part of driving business value.





Optimizing a business that is under-capacity

One final example to consider is when a company has spare capacity, meaning its capacity exceeds the current demand for its products. In this situation, the use of resources becomes less critical but, nevertheless, it's still crucial to properly model how they are managed to properly support fundamental questions:

- ❑ What is the best use of a resource? While the resources may not be fully constrained, there are still trade-offs that impact costs, lead time, inventory investment, etc. These trade-offs must be considered as they can have a significant impact on margins.
- ❑ What is the best tactical strategy for the business? This question is a unique one, as it considers the business more holistically. For example, which products should we be promoting, into which channels, given the marginal revenues generated and the marginal costs incurred to support the revenues. Answering these questions intelligently often identifies opportunities to increase profit by pursuing profitable demand, while potentially reducing efforts to generate unprofitable marginal demand.



“ The optimal decision today... might not be the optimal decision tomorrow. The world keeps changing. It's annoying. Luckily, there is digital planning twining that keeps track of all those changes and recalibrates the situation each time you run the model. You can actually set it up to have the model compare itself to what's actually happening.

— Chris McManaman,
Head of Commodity
Trading, CGI

The Business Impact of a Digital Planning Twin and Prescriptive Analytics on S&OP and Supply Chain

The importance of having the highest quality modeling and analytics capabilities within S&OP inevitably impacts the key trade-offs in the business as it drives the understanding of profitability. Imagine now that you need to plan promotions three to six months out, but you have a limited budget and limited capacity to support the promotions. You want to know where to allocate the promotional budget and production capacity optimally — in other words, find the plan that would maximize profit and satisfy strategic priorities (e.g., top customers, innovation SKUs, growth in a new geography, etc.). If the underlying plan is not feasible and/or not optimal, users have the wrong idea of what is achievable, and the forecasted cost and profitability will be ill-informed. Therefore, the outcome supports decisions that fall short of maximizing the impact of a firms' resources on achieving its strategic objectives.

With a digital planning twin at the center of all supply chain decision-making, however, planners can rest assured knowing that the plans they produce will not only be feasible, but they will be optimized across the many business units that fall within and outside of S&OP. The business impact is unmatched, with benefits like:

- ✓ Year 1 profit improvements equal to 2-5% of annual revenue
- ✓ Higher revenues
- ✓ Avoidance of capacity and product short-falls that could've been managed ahead of time
- ✓ Increased customer service
- ✓ Improved cross-functional collaboration, planning agility and forecast accuracy
- ✓ A significantly reduced time-frame for scenario analysis and planning time

“ Having the ability to model a business so that it links relationships between business units and understands financial metrics is huge...Maximizing the impact of S&OP on the business requires the ability to blend operations and financial data. Most tools today can't tell you the operational impact that overtime, moving volume, etc., will have on your financial metrics. If our customers really want to think about speed and streamlining their business, they need to be able to model changes and improvements before they make decisions.

— Bill Remy and Ken Koenemann
of TBM Consulting Group

Appendix A

Gartner's Magic Quadrant inclusion criteria state that an S&OP the vendor must have reasonable capability in at least 12 of the 13 key capability areas of a S&OP system of differentiation:

1. Collaboration support – moving more towards a multi-enterprise environment
2. Hierarchy/translation management – aggregating/disaggregating, switching from units to financial UOMs etc.
3. Process management – including templating, assumption management, and auditing
4. Tight integration to SCP system(s) of record – supporting active decision making in the S&OP process
5. Integration to other SODs and systems – either directly or via a SOR – e.g. CRM, CPM, BI, MEIO
6. Supply chain modeling to support creating scenarios – especially for the longer-term horizon
7. Scenario planning and management – including the versioning and socialization of scenarios
8. Solution configurability
9. Support for global deployments – including planning speed and scalability
10. Financial impact analysis and planning – including predictive financial reports
11. Performance management and analytics – including scorecards and dashboards and support for automation of aspects of the S&OP decision making
12. Simple user experience – including use of Excel as a UI and/or mobility to aid use/access
13. Project planning – support for NPI/product reviews and other supply chain initiatives



About River Logic

River Logic has been a global innovator in prescriptive analytics (optimization) since 2000. Its platform — designed for business users — enables enterprise-wide optimization, collaborative planning, and performance management, all delivered through a revolutionary user experience. By understanding how to best utilize cross-functional resources and manage trade-offs, companies make more impactful decisions.

River Logic goes to market primarily through partner organizations like PwC, Deloitte, West Monroe Partners, and Microsoft, helping them develop high-value applications that monetize their IP. Recent clients include Unilever, BHP Billiton, Boise Cascade, McKee Foods, and the Russian Post. Typical client value-add ranges from 10% in cost reduction to profit improvements equal to 2-5% of annual sales. River Logic strives to help every customer achieve at least 10X return on investment, but it is common for customers to see even higher returns.

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