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Determining if You're Ready For Prescriptive Analytics

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Carlos Centurion is President of River Logic and is responsible for overseeing design, development, marketing and delivery of all River Logic solutions. He works closely with prospects, customers, partners and industry thought-leaders to continually improve value delivered to global organizations. Earlier in his tenure at River Logic, his thought leadership drove solution development, integrated financials into company planning and decision support processes.

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Eric Kelso, Vice President of Product Management for River Logic, and his team are responsible for the design, development and support of the Enterprise Optimizer and EO Server platform products. Since joining River Logic in 2000, Eric has worked closely with direct customers, partners and company consultants, including work as primary EO modeler for River Logic's Pulp and Paper Industry and Trade Promotion Optimization solutions.

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FINDING YOUR
FIRST USE CASE

Most likely your organization uses a form of prescriptive analytics, but it's embedded deep into a function supporting a niche decision that is repeatedly made, like picking routes for your product delivery. There is always a case to extend these into broader problems. Additionally, if you have complex decisions supported by tools such as Excel, then you may have a strong business case. The first question you need to answer is how prescriptive analytics may apply to your business. In other words, how do we identify the top use cases?

Organizations should consider several factors in defining prescriptive analytics use cases with the highest likelihood of success. They include:

- The applicability of optimization to the business problem(s), such as constraint-based modeling/optimization

- Where to look first

- Requirements for successful adoption

APPLICABILITY OF OPTIMIZATION **TO THE BUSINESS PROBLEM(S)**

In other words, can we define the problem as a constraint model that can be optimized? Furthermore, can we identify the differentiated value/ insights that can be generated? There are four core considerations in defining an optimization use case:

- **DECISION SPACE**: What decisions, trade-offs, and interactions between possible decisions (i.e., can you define a complex decision tree) are required to solve the problem?

- **DEFINABLE OBJECTIVE(S)**: What are the objectives we are trying to maximize, minimize, or meet? These may include maximum profit, minimum cost, maximum throughput or volume, maximum ROIC, and a target blend quality.

- **LIMITATIONS**: Can we quantify the constraints impacting the value of the solution, for example, HR policies, resource capacities, marketing budgets, the number of marketing messages into an audience within a period of time, or blending targets for coal? Remember, recognizing business realities is critical in defining marginal versus average profitability.

- **MINIMUM LEVEL OF COMPLEXITY**: How complex is the decision? Would it be easier to write an Excel model? Problems with a minimum of 20+ decision variables are good candidates for optimization. For example, consider a decision that includes four products, two resources, and three customers. It faces 24 decision variables. In addition to these, additional dimensions may include time, inventory, channels, marketing events, inputs, and working capital policies.

Table 2 below serves as a guide to help you determine the complexity of your problem. It's a starting point to help you think through the problem, but you would need to multiply the number of variables for all rows to estimate the size of your problem:

Table 2. Determining the complexity of your problem

CATEGORY	OPTIONS	NUMBER OF VARIABLES
Products	Brand, SKU, promoted group, etc.	Number of brands or SKUs
Customers	Segment, channel, location, customer, etc.	Total number of combinations
Time	Quarters, months, weeks, days	Total periods to plan for
Resources	Labor, assets, machines	Which ones affect decision
Delivery	Service delivery centers, logistics (flow paths and DCs)	Alternatives to deliver product or service
Inputs	Suppliers, raw materials	Inputs that affect decision
Policies	Budgets, managerial Key Performance Indicators (KPIs)	Set boundaries on decisions

A tried and true approach to spotting good candidates for optimization is to ask your colleagues if they are supporting decisions with overly complex Excel spreadsheets or, even better, multiple Excel spreadsheets that work in parallel or sequence. Occasionally, companies also use planning engines that rely on rules to make decisions and these can also be good candidates (for example, as in most supply planning tools or tools that allocate capital investments).

WHERE TO **LOOK FIRST**

From a business standpoint — and while not an exhaustive list — Table 3 suggests some typical situations that are tell-tale signs of the need for optimization.

Table 3. Symptoms that indicate a need for optimization

SITUATION	SYMPTOMS	EXAMPLES
Policies that guide behavior	Decisions are made out of habit or people fail to make decisions	• Sourcing products from a specific plant to serve a specific market • Prioritize customers based on volume and revenue • All our surgeries start at 6:00 am because that's how we've always done; • On oncology clinic opens from 8:00am-5:00pm based on historical analysis and no-one has recently analyzed why
On-going Complex Planning Processes that are treated sequentially today or that are made in isolation	Decisions driven by silo thinking—tactical and strategic decisions involving resources, product/service mix, and marketing that are made solely within the function	• Sales and operations planning, where decisions about sales/marketing manufacturing, procurement, distribution, and finance are made sequentially. • S&OP where different tools or spreadsheet models are used for planning
Highly dynamic situations	Input/product prices change constantly and regulations evolve	• Commodities Industries • U.S. Healthcare Industry • Chemicals • Oil and Gas • Finance
High difference in average versus marginal decision making	There can be up to 100% difference in average versus marginal profitability for the same products	• Multiple constraints, volume contracts, and output price differentials • These are ideal situations because prescriptive analytics automatically identifies and considers these differences on the margin

REQUIREMENTS FOR **SUCCESSFUL ADOPTION**

This is a broad category that includes all the required components for implementing a prescriptive analytics solution for the identified problem. The main objective at this point is to understand the feasibility and effort required to drive user adoption and deliver the full value proposition such that the initiative delivers a strong ROI.

Below is a high-level "checklist" of items that should be considered to maximize the potential for success.

ORGANIZATIONAL READINESS

Is the organization in a state where an initiative like this could be undertaken? Ask yourself the following questions to determine whether your organization or business unit is ready to undertake such a problem:

- What would your vision be?
- Where would you focus a Proof of Concept (POC)?
- Who would be the right executive sponsor(s)? (note: it is often more productive to involve the business and finance)
- Could you have access to the personnel and budget to undertake even a POC?

DO YOU NEED A MODEL OR A FULL SOLUTION?

Often, prescriptive analytics deployments are limited to a model and one or few expert users. In contrast, some of the end-to-end use cases that bring more transformational value require multiple business users to interact with each other, collaborate on scenarios, and track performance against plan. What type of solution will be required to solve the business problem and ensure the right level of adoption? Conduct a high-level mapping of the "to-be" planning process to help define the components required:

- Where would the inputs come from? Is there a need for integration with other systems? Would the problem require statistical inputs such as demand forecasts, currency movements, or asset breakdown variability?

- Is there a need for users to enter, validate, and approve certain inputs? How would the users need to visualize these inputs? Do we need to track who approved the inputs and when?

- What kind of scenario analysis is required, if any? Are the scenarios standard and on a set frequency vs. ad-hoc? Is there a need to automate running of the scenarios? Will different users need their own private sand box to run the scenarios? Is there a need for strong collaboration across users?

- Will senior management need to see the scenarios or plans? What kind of visualization would be required for this? Do users need the ability to define their own reports?

- Does the process require tracking and comparing an official plan (i.e., a budget) against the latest plan and actual performance?

DO YOU HAVE ACCESS TO THE DATA YOU NEED?

A crucial step in understanding if you're ready to address a problem using prescriptive analytics is to determine if you have access to the data you need. If you don't or you only have some of it, determine how difficult it would be to develop/cleanse the data you need. Typical data used for prescriptive analytics includes:

- **MASTER DATA**: Defines the structure of the organization, including products/services (i.e., product hierarchy), customers, personnel/resources (i.e., assets, BOMs, routings, throughput rates), supplier contracts and financial reporting structure.

- **OPERATIONAL VARIABLES**: Define the specific situation. Examples include demand (orders/forecasts for service/product including quantity, price, and location), starting inventories, input availability, and costs. It is important to define not only how the business works, but also how it incurs revenue and costs.

- **OBJECTIVES AND CONSTRAINTS**: These are important as they define

the key limitations and business objectives. Note that sometimes they are two sides of the same coin. For example, a user may want to see the maximum revenue possible subject to a minimum amount of profit, while another may want to maximize profit subject to a minimum service level.

• **DECISIONS**: In addition to well-defined decisions such as where to make a certain product, it's often useful to identify activities that are currently not being done, but that could be undertaken. This is an area where data creation often leads to significant new insights and value for the business.

INVESTMENT AND ROI

The last step you need to understand if you're ready is to determine the kind of investments you will need to make and the likely return on those investments. At this point, it is important to understand orders of magnitude.

• Include here personnel, external consultants, and software that might be needed, bearing in mind the next step is a POC that would yield a more accurate estimate of both the investment and estimated value (Refer to Chapter IV: Getting Started with Prescriptive Analytics). Nevertheless, note that total implementation time ranges from 12-20 weeks for a team of 2-5 people depending on the scope.

• To calculate the initial ROI, compare the resource cost against the value expectations. Keep in mind that typical ROIs from prescriptive analytics initiatives return anywhere from 5x-20x investment in the first full year of use.

SUMMARY

At this point, you should have the following items clearly defined

- Your problem definition

- A rough idea of how to approach solving the problem

- The estimated range of value expected from solving the problem

- A perspective on the likelihood of success from such an initiative

It is entirely acceptable to have some gaps and ranges, as the objective at this point is to articulate a vision and recruit the champions to help you go to the next step.