ADEXA Predict, not just response

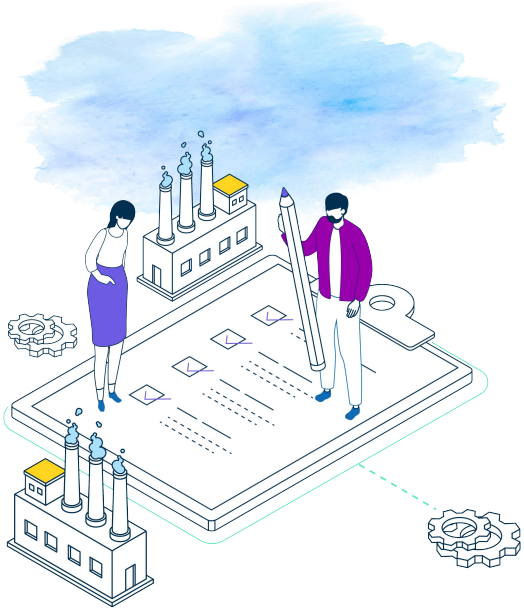
Manual Scenario Analysis is a Futile Exercise

Almost all current S&OP solutions and so-called Control Towers provide an environment for what-if scenarios driven by the users. The process is limited to changing a few variables out of thousands of different combinations to see if it gives a desirable outcome. Given the number pf potential scenarios that are available to the users and exponential growth of the different outcomes, the users can at best examine a handful of them and settle for a result that simply works but far from optimal. On the other hand, systems are capable of examining millions of scenarios using AI techniques such as Constraint Propagation in order to deliver the best possible result in almost real-time. Thus, eliminating the need to spend so much time by the users resulting in an inferior outcome.

In order to show the complexity of what-if and scenario analysis, consider only 20 customer orders that require same resources and requiring overlapping materials from suppliers. Let's assume that there are 5 suppliers and 3 alternate suppliers and only 5 resources that may not have enough capacity for all the orders to be delivered on time. In a typical scenario analysis, the system tells the users 3 out of 10 orders are late because of 2 capacity issues and 3 material shortages. But by expediting the material availability, going to a different vendor, or paying more to get the current vendor to deliver on-time, we may run into yet another problem of capacity shortages with 4 other resources. Then, one has to decide which orders are given higher priority, what alternate resources are available, can substitute parts be used; and what the impact would be on other orders and/or cost if a couple of them are given a higher priority. The number of combinations for such a simplistic situation, conservatively, is over 100 not even taking into account conflicts between sales and production as well as improving resource utilization and decreasing cycle times.

Imagine, in a more realistic environment having thousands of orders, if not millions, and thousands of part numbers and resources. Using a manual scenario analysis with every disruption, small or big, would yield an extremely narrow view of possibilities and a very limited visibility. Currently, the way the scenario analysis is carried out resembles a design process that requires some creativity and trial and error. However, it is not a scientific approach. Much like any design process, manual what-if scenario analysis has to deal with infinite possibilities! Human judgment is used in order to narrow down the search space and laboriously try different changes until an acceptable, more likely sub-optimal, solution is *constructed*.

Same issues can be encountered when companies use scenario analysis for improving supply chain resilience. The number of combination of nodes in the supply chain, supply chain connections, part numbers, inventory points amount to tens of millions of possible breakpoints in the supply chain. The number



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would grow exponentially when you add all the other variables such as cost, multi-tier suppliers, carbon emissions, compliance and regulations amongst other factors. A manual analysis of where the vulnerabilities can be found is simply a futile exercise of trial and error in a space of tens of millions of possibilities.

An Automated Approach to Scenario Analysis

Systems are perfectly capable of performing automated scenario analysis if they are designed to have the following capabilities:

- Ability to model the environment accurately, i.e. a true digital twin
- Having the smart algorithms needed to scan the model for possible highly desirable outcomes
- Be able to do the above in almost real-time

As mentioned earlier, Adexa uses Constraint Propagation (CP) and a number of other AI techniques in order to very quickly find the best possible alternative solutions depending on the objectives specified by the users. The technique works by continuously eliminating undesired solutions making the possible search space smaller and smaller until it arrives at a solution which is close to optimal satisfying all the possible constraints. The so called 8-Queen problem* in chess and how it can be solved using CP illustrates the effectiveness of this approach.

Within seconds many different possibilities are examined and their effectiveness understood using such an automated approach. Manual analysis may still be used in some cases requiring the kind of information which may not be available to the system or choosing amongst the top results provided by the system. Thus, the role of the user becomes more of a data analyst choosing the best possible solution as opposed to constructing one. This interaction creates a metaverse of planning where digital and physical come together to find the best possible course of action for the company. To learn more about automated scenario analysis click **Here**.

Let's make **accurate** plans together!

** The problem of placing eight queens on an 8×8 chessboard such that none of them attack one another*

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Adexa 5777 Century Blvd. Los Angeles, CA 90045 USA (310) 642-2100 | (833) ADEXAINC www.adexa.com info@adexa.com
Adexa's worldwide locations **North America:** Los Angeles, CA | Toronto, ON **Europe:** Germany **Asia:** Japan | China | Taiwan | South Korea