

# Why Airlines' Network Planning Must Be Bionic

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The impact of COVID-19 on air travel has been nothing short of devastating. When the pandemic hit, countries closed their borders, businesses shifted to remote rather than in-person meetings, individuals self-quarantined—no one was going anywhere. The airline industry's recovery has been slow and shaky ever since.

As the future unfolds, demand will be much more volatile than ever before. For one thing, there will be a greater number of close-in bookings, because until the virus is under control and people are more certain about their finances, travelers will avoid

The virus's repercussions have amplified the need for airlines to become drastically more flexible and agile in all departments.

They might work to determine, for example, whether the airline should increase capacity by 3% or 5% next year in Asia, if it should open new routes or increase frequency on existing routes, what the

optimal deployment of the fleet should be, and so on. Based on this blueprint, scheduling and operations teams made their staffing, equipment, leasing, and asset deployment plans. Each of those activities were typically siloed, with relatively limited cooperation among the different departments. Seasonal or monthly schedules were generally predictable, with minor modifications year over year. Additional small changes were sometimes made close to the day of operations in response to shifting conditions. But overall, in terms of destinations and frequencies, upwards of 95% of most schedules looked very similar from one year to the next.

That's not good enough anymore. To adapt to the new dynamics in the marketplace—to jump quickly on opportunities and anticipate and react to threats—network and scheduling teams will have to be more dexterous and collaborative. They'll need to significantly increase the frequency and extent of schedule modifications in coordination with other relevant airline departments. These rolling schedules could include changes to destinations, flight frequency, aircraft deployment, and bases. Perhaps most important, to successfully implement this new approach, airline network planning and scheduling must become bionic, combining human intelligence and state-of-the-art technology that can manage more-frequent changes quickly and accurately. (See “The Technology Factor.”)

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## THE TECHNOLOGY FACTOR

While scheduling will always require human analysis, the role that AI and other advanced digital solutions will play in that work cannot be overstated. With so many complex elements, calculations, and management and operations issues affecting scheduling decisions, network managers will no longer be able to rely on manual tools or rudimentary technology. And with so much continued volatility in the airline industry, they won't be able to use historical models to inform future trends.

Airlines should recruit and embed data scientists and software engineers in network and scheduling teams to manage technology improvements and ongoing innovations. Many of the new data tools will provide extremely granular predictive assessments that are crucial for accurate scheduling. For example, BCG's [Zero-Based Demand](#) tool, which is a part of the Zero-Based Scaling suite, uses industrywide search and booking data and epidemiological and customer mobility forecasts to predict the number of passengers by origin and destination at future dates. The application's accuracy rate at 6 to 12 weeks out is between 80% and 90%.

That's just one example. Integrated decision-making solutions cover a wide gamut of possibilities today. In other strategic network and scheduling optimization applications we have been able to combine data from crew, maintenance, and equipment operations with data related to network and revenue management, allowing airlines to create new schedules or adapt existing ones frequently while continuously weighing the impact on crew or customers.

These data management breakthroughs are possible now because readily available machine-learning optimization algorithms have become sufficiently powerful to solve complex decision problems. Moreover, application program interfaces (APIs) can extract data from the many department-specific information warehouses airlines have in legacy systems—separate sites for data about crew, maintenance, customer bookings, and so on. APIs can then integrate that content into joint data that can be used with virtually any type of technology backbone and architecture to generate scheduling analyses and decisions. In that way, the new working model for network teams can be implemented even while new advances in data

platform technologies are developed, one supporting the improvements of the other.

## **REIMAGINING NETWORK PLANNING AND SCHEDULING**

To move to a more agile and integrated network and scheduling process, airlines can rely on their network and scheduling teams' current structure, but significant changes will be needed in the way technology is leveraged and information is gathered, shared, and integrated to make the process more interactive and iterative. Here's an in-depth examination of the three steps in the network planning and scheduling process and how those processes must be improved.

**Network Planning: Strategic Inputs and Optimization Objectives.** Currently, generating an initial frequency plan or high-level schedule a year out is a linear, even repetitive process that is led by the network team and often based on the prior year's performance. This still tends to be too much of an inward-looking activity based mostly on internal data and assumptions on competitor strategies that aren't as sophisticated as they could be. In the past, this approach often worked well enough, as the past was a decent predictor of the future. However, historical data is no longer as reliable due to structural changes as well as more-frequent dynamic shifts in the market that affect business travel, performance of flights, customer sensitivity, pricing, and many other factors. As a result, it is critical for network planners to use much more dynamic competitive assumptions and incorporate a significant amount of external data. That will be a big change for all airline departments, since the use of historical data or patterns is engrained in most systems and planning processes.

While expanding strategic inputs for this phase cannot be accomplished entirely by implementing digital tools (the bionic approach that we recommend is a blend of human and digital capabilities), artificial intelligence should nonetheless be a cornerstone. AI can help quickly and comprehensively sweep through larger pools of internal and external data, producing rapid and creative solutions and identifying market or operational shifts that network teams should be aware of. Equally

important, AI increases the network team's ability to run complex scenario simulations and optimizations, making it easier to assess the impact of possible competitor moves or potential changes in market conditions.

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In this stage, network teams must collaborate with senior management and all of the airline's departments to determine the carrier's optimization objectives, whether cash on hand, profitability, market share improvements, or other possibilities. While those discussions do happen today, they need to be more comprehensive and frequent, given the more rapid changes in market conditions and strategic responses.

The questions most likely to be addressed at this stage include:

- Which customer flows do we intend to serve, particularly in light of a likely structural shift in the market, with leisure travelers coming back faster and in higher numbers than business travelers? In making this decision, potential competitor actions should also be taken into account. For instance, a Middle Eastern carrier might want to serve travelers between secondary cities in Europe and Australia via its hub, a move that would require assessing the strategies of other Middle Eastern carriers as well as European and Australian ones.
- Which destinations or frequencies are strategic must-haves that would need to be served by at least a few flights a day in order for the carrier to maintain its relevance in a particular market, even if doing so generated an immediate loss?

This question will increase in importance as the pandemic subsides and airports remove waivers that allowed carriers to retain highly valuable slots without penalty even if they went below a certain use threshold.

- What revenue assumptions should be made based on strategic positioning and competition? For example, an airline with a particularly high quality-of-service rating and extended presence in a market may be able to assume higher revenue than other carriers.
- Which aircraft types and fleet size are available that would help maximize potential aircraft usage in peak seasons by shifting maintenance and other fleet operational activities to less-busy months?
- What are the implications of network changes on our resource needs and cost base? This should be considered at a fairly granular level, such as by subfleet and destination—including hidden and nonperformance costs—to ensure that profitability analyses are as accurate as possible.

**Network Scheduling and Operational Planning: Staying Flexible While Looking Ahead.** Based on an expanded array of strategic inputs, the scheduling team should produce an initial schedule about a year or so prior to the day of operations. But unlike in the past, this should be a flexible document primed to evolve as continuous simulations of possible market conditions are run to integrate actual or expected regulation shifts or trends, such as new health-related restrictions or changes in booking. Here again, AI should support the activities of the scheduling team. For example, BCG's [Zero-Based Scaling](#) network optimization suite generates and fine-tunes optimized and implementable schedule scenarios, integrating customer demand shifts, operational constraints, and profitability targets. It takes into account all expenses, including variable costs at a granular level, and pays particular attention to critical (but often overlooked) crew cost modeling.

The outcomes of these simulations can drive major operational decisions, such as opening or closing routes and stations or making drastic shifts in flight frequency.

These revamped schedules can be issued up to about two weeks before the day of operations. For most carriers, big operational changes are generally not feasible any later than that, especially given that when flights with legs in the European Union are delayed or cancelled closer to take-off, carriers may have to compensate passengers under EU regulation 261.

As the breadth and frequency of scheduling changes increase, resource planning, especially related to the number of workers and type of equipment needed on the day of operations, will be substantially affected. Consequently, while managing schedule iterations, network and scheduling teams cannot operate in isolation. In the past, networks often relied on generalized rules of thumb to estimate resource requirements for different schedules. But under our recommended new approach, network managers must work in parallel with planning teams from operational departments such as crew, maintenance, hub, and outstations to repeatedly review possible changes in operational constraints and resource availability. They must work together to determine whether these scheduling adjustments are not only feasible but also optimized for jointly agreed-upon objectives. This can be accomplished either by having the long-term operations planning teams co-located within the network scheduling department or by establishing a well-defined process for interdepartment communications that includes a series of weekly or even daily meetings.

This type of organized network planning management can produce impressive results that both maximize revenue and minimize costs and inefficiencies. For example, as part of BCG's [partnership with KLM Royal Dutch Airlines](#), we developed a tool called ALIGN that creates as many as 100 versions of the schedule to replicate what is expected to happen on the day of operations. This allows planning teams to examine possible variabilities of and the potential impact on resource needs and network performance at a granular level under different circumstances (such as bad weather, ATC disruptions, or summer peak demand). Using this and other tools, an airline can be more confident that it is linking the schedule to equipment and staffing decisions that will maximize profits by avoiding overstaffing and still taking calculated, well-balanced risks on occasion.

These tools and approach allow a carrier to find the optimal balance between commercial and operational considerations, with agreement among the different teams about tradeoffs based on actual data and reasonably accurate forecasts of operational performance, revenue, profits, and costs. Using digital solutions, this process can be run overnight for multiple scenarios, replacing what is currently weeks of analysis for just one possible outcome.

**Day-of Operations: Preparing for Changing Conditions.** This phase usually starts about two to four weeks prior to and up until the day of operations. Given that the emphasis in this step will be primarily on quick and flexible operational shifts, we recommend that the network orchestrator team (which, for the purposes of continuity should include people that designed the original schedule) be part of the operations control center. This permits close, mutual feedback loops between the operations and network departments and rapid, collaborative decision making based on shared data points. On the day of operations, the operational control center becomes the new orchestrator.

This part of the process is driven by real-time forecasts for the availability of individual aircraft and crew members, passenger flows, and external information such as weather and other potential disruptions including air-traffic control restrictions. From these forecasts, options involving efficient allocation of aircraft, last-minute changes to crew pairings, maintenance needs and deferrals, and gate assignments can be considered.

Harnessing multiple data feeds and using AI to support rapid data gathering and assessment is essential in this stage, too. Investing in technology as a way to improve efficiency and performance on the day of operations (as well as the outcomes of the other necessary enhancements to network scheduling) has already [proven to be valuable](#) for some airlines.

## **BRINGING STAFF ONBOARD**

To implement the new scheduling approach, network and scheduling teams must work more intensively with commercial departments and resource providers. In

turn, this necessitates shifts in the types of skills that network team members will need and in how well the airline is prepared to monitor and manage collaborative working arrangements.

Perhaps the most critical new capability for network and scheduling team members is being able to work well in a large group of decision makers while also serving as orchestrators to drive consensus from diverse opinions and data. The depth and efficiency of this collaboration should be measured and used for employee evaluations through a series of relevant KPIs.

Some airlines organize their network and scheduling teams by geography, and some organize by time horizon (whereby one team might handle winter schedules with a single person in charge of November, another in charge of December, and so on). To facilitate the increase in scheduling and strategic adjustments, we recommend structuring the network team around times of the year. The primary advantage of this is that network team members will have more in-depth knowledge of trends during certain months or seasons. The downside is the need for network teammates to proactively coordinate with one another every time they alter the schedule to ensure that their changes are coherent across schedules for other upcoming periods.

## **USING TECHNOLOGY TO ALIGN ORGANIZATIONAL GOALS**

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Bringing network planning and scheduling into the bionic age is a major undertaking, but the potential results—particularly in a volatile time for airlines—make it worthwhile. The most obvious benefit during the pandemic but beyond it as well is that adopting such

changes give carriers a  
lifeline for dealing with

unexpected disruptions in demand and anticipating changes in traveler attitudes. In an even larger, organizational context, doing so can improve the airline's planning culture, providing more coherence throughout the company both in terms of the data used to make and alter schedules and the strategic and financial goals (such as profitability) that the schedules are meant to support. Collaboration is improved and feedback loops to learn from scheduling decisions are more frequently employed, while the use of technology becomes more embedded in the organization.

For airlines, all of these cultural and operational shifts are long overdue. While the Covid pandemic may be the catalyst for these changes, the new network-planning approach will be essential after we're past this demand crisis to enhance airline capabilities, organizational resilience, and market strength. However you want to look at it, one thing is certain: airlines cannot afford to wait for another crisis to implement what they are learning in this one. The right time to alter network and scheduling processes is now.

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