

 REPORT

Weather Risk in Event Operations:

The Gap Between
Forecasts, Decisions,
and Outcomes.

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Executive Summary

Weather has always influenced events.

What has changed is its role: It is now a consistent operational constraint, not an occasional disruption.

While the industry broadly understands that weather impacts events, and most have experienced it firsthand, there has been far less clarity on how it shapes the decisions behind them – how forecasts are interpreted, who is involved, and when choices are made under pressure.

This study, conducted in collaboration with the Event Safety Alliance, Global Crowd Management Alliance (GCMA) and United Kingdom Crowd Management Association (UKCMA), uses survey data and industry context to identify key patterns, risks, and opportunities, and examine how weather decisions are made under operational pressure across event types, roles, and scales.

Three insights stand out:

- **Decisions are driven by the intersection of forecast confidence and operational exposure.**
Over 90% of decisions occur within 48 hours of an event, with nearly one-third made during execution, when conditions are most clear and stakes are highest.
- **Weather risk is operationalized.**
Over half of the organizations have a formal, consistently applied plan. Weather is embedded in operations, not treated as secondary.
- **Weather intelligence is used, but not consistently.**
Teams are generally confident using forecasts, but variability remains in how data is interpreted and applied.

The findings point to a clear shift:

The challenge is no longer access to weather information, but the ability to apply it consistently under pressure.

This gap between information and execution – between having a plan and being able to act on it decisively when conditions deteriorate – remains one of the most persistent and under-addressed challenges in event operations today.

By Renny Vandewege, GM Weather and Climate Intelligence, DTN



Key Takeaways

Weather doesn't stop at the door.

94% of events are operationally impacted by weather, regardless of whether they're indoors or out.

It's not a bad year; it's every year.

71% of organizers have been impacted by three or more weather disruptions in the past five years, and 70% of those have experienced repeat disruptions at the same event.

Cancellation isn't the real threat; disruption is.

55% of organizations lose revenue even when their event still happens. The biggest cost driver isn't cancellation; it's staffing, damage, and refunds that pile up when events run compromised.

Safety wins every time but confidence is the gap.

Attendee safety is the primary decision factor, yet only **1 in 3 decision-makers** describes themselves as very comfortable in interpreting weather forecasts.

When the window opens, the margin for error closes.

90% of weather decisions are made within 48 hours of an event, and 1 in 3 are made during the event itself, with no time to start planning.

Plans exist; consistency doesn't.

60% of organizations have a formal weather risk plan, but 58% still say their biggest need is clearer thresholds and decision triggers. Having a plan isn't the same as knowing when to use it.

*58% of respondents believe their weather risk is higher today than it was five years ago — only **12%** report that it has decreased.*

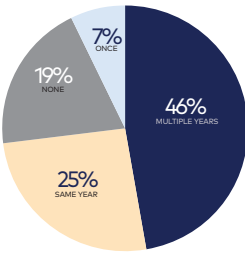
The Scale of Weather Disruption

The Frequency and Drivers

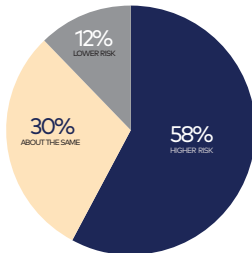
Understanding how often weather disrupts events, and which conditions are the biggest drivers, is critical to assessing risk.

Survey data shows that weather disruption is a recurring operational reality across event types and sizes. Over a five-year period, a clear pattern emerges: disruption is both frequent and cumulative.

Nearly all respondents experience at least one form of operational weather impact. The majority reported repeated weather disruptions to the same event.



Weather Disruption Frequency



Weather Risk Increasing

This has important financial implications. On their own, these impacts are manageable; together, they create meaningful exposure.

Events are rarely canceled outright. More

often, they continue under modified conditions via schedule changes, temporary suspensions, or evacuations.

Every modified outcome requires a decision, e.g., an altered schedule or an evacuation. The quality of those decisions and the consistency with which they are made are the variables that separate organizations that absorb disruption from those that are defined by it.

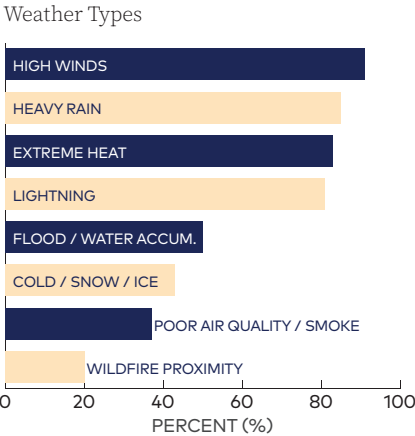
Weather disruption is not episodic; it's cumulative.

The industry is not managing unpredictable bad luck; it is managing a known, recurring operational risk at known events in known locations. That distinction has significant implications for how pre-season planning should be structured.

Weather exposure doesn't end at the venue door.

Common Weather Types

The frequency of disruption is closely tied to the types of weather events that impact operations. Respondents identify several weather conditions affecting their events, with a clear concentration around four primary conditions:



The extent of these disruptions is also shaped by where the event takes place. Survey responses indicate that only 38% of organizations primarily operate outdoors, while 36% report a mix of indoor and outdoor environments, and 26% primarily operate indoors.

Despite variation in indoor vs. outdoor events, disruption rates remain consistently high across respondents, suggesting that exposure to weather is not limited to fully outdoor events.

Even events classified as indoor often include operational elements that extend beyond enclosed spaces. Outdoor queuing, entry and exit flows, parking logistics, and temporary structures introduce points of exposure where weather conditions can affect attendance, timing, and safety.

As a result, weather conditions typically associated with outdoor events, such as rain, wind, and heat, continue to influence outcomes even when the primary venue is indoors.

Importantly, the weather types identified are also among the most operationally disruptive. Unlike mild or nuisance conditions, they often trigger immediate safety protocols or operational decisions.

Lightning frequently necessitates evacuation or shelter-in-place procedures, and high winds can pose structural risks to stages, tents, and temporary infrastructure. Heavy rain can affect accessibility and movement, and extreme heat introduces health and liability considerations.

It is also worth noting that extreme heat — the third most cited weather type — is a well-documented contributor to heat stroke and cardiac events at outdoor gatherings.

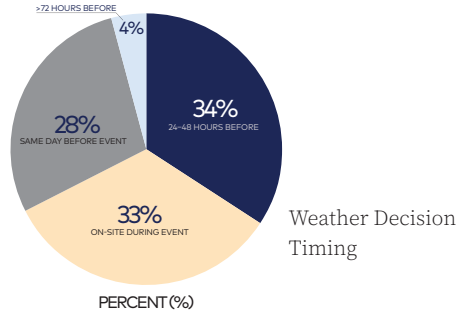
Thirty percent of respondents report experiencing weather-related medical incidents, a liability signal that warrants more attention than it typically receives in operational planning discussions.

How Weather Impacts Operational Decisions

The Decision Window

Respondents report that the timing of weather decisions is consistent across organizations, regardless of planning maturity. Teams with formal, consistently applied plans do not make decisions earlier than those with informal or unwritten approaches.

Across all respondent groups, decisions cluster within the same narrow window. More than 90% of weather-related decisions are made within 48 hours of an event, with nearly one-third occurring during the event.

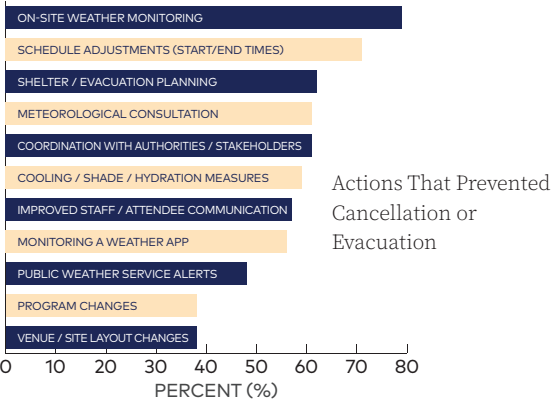


The fact that planning sophistication does not correlate with earlier decision-making reveals that written plans, on their own, are not producing the execution outcomes the industry needs.

A formal plan still results in on-the-fly, day-of decisions. The real gaps identified by respondents, such as clear thresholds, defined roles, and practiced training are the infrastructure that move decisions earlier and make them more consistent.

Respondents report that weather decisions often involve coordination with venue operators, weather providers, and public safety agencies. Interpreting weather information, therefore, requires alignment across multiple stakeholders.

The findings also suggest that organizations rely heavily on proactive operational measures, such as on-site weather monitoring, schedule adjustments, and coordinated communication to reduce the likelihood of cancellations or evacuations during severe weather events.



Respondents could select multiple responses; percentages do not total 100%.

Decisions are made where uncertainty is highest and consequences are most immediate.

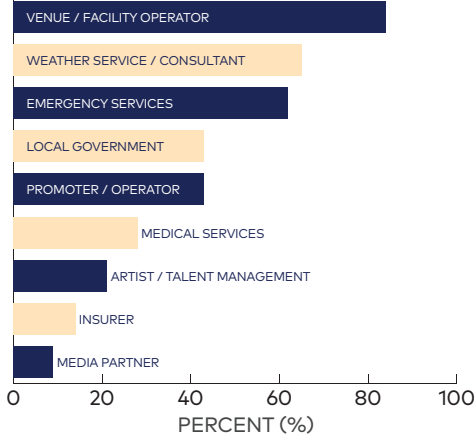
Decision-Making and Authority

Weather-related decision-making is constructed through the interaction of multiple inputs, external stakeholders, and competing decision criteria.

Weather data serves as the foundation. Forecasts and real-time monitoring provide the primary inputs, while confidence in that information is one of the most influential factors in decision-making. However, data alone is not sufficient to drive action.

External organizations, including local authorities and safety agencies, play a critical role in shaping decisions.

Decision Stakeholders



Respondents could select multiple responses; percentages do not total 100%.

The question of final authority further clarifies how decisions are executed in practice, showing that authority is typically shared among multiple stakeholders rather than centralized.

While this collaborative approach reduces risk, it also introduces complexity. Multiple data sources, different levels of confidence in interpreting forecasts, and shared authority structures can slow decision-making and create variability in outcomes.

When authority is distributed, alignment becomes critical. Without clearly defined roles, thresholds, and escalation paths, similar conditions may lead to different decisions across organizations or within the same organization over time.

Decision authority is often distributed rather than centralized.

Organizational Readiness

Weather Risk Planning

Most organizations recognize weather as a risk and have taken steps to plan for it. Sixty percent report having a formal written weather plan that is consistently applied, while roughly one-third report having a written plan that is informal or inconsistently used.

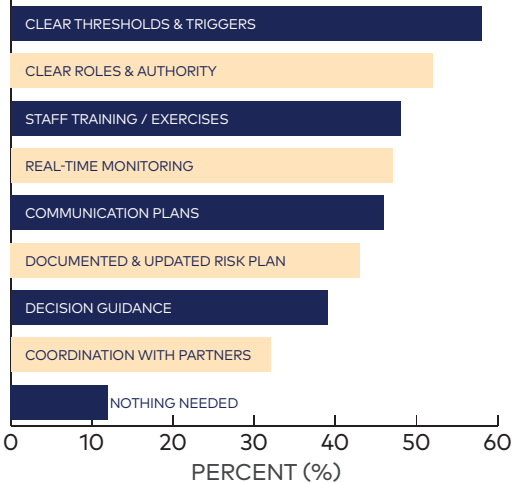
But planning alone does not determine outcomes.

Respondents consistently emphasized the need for clearer decision structures, stronger role alignment, and more operational guidance during weather events.

This points to a broader industry shift: weather is increasingly being treated not simply as a forecasting issue, but as a real-time operational management challenge.

Weather is increasingly being treated as a real-time operational management challenge.

Strengthening Decisions



Additional responses (each <1%) included improvements to radar coverage, forecast interpretation and other operational considerations. Respondents could select multiple responses; percentages do not total 100%.

Notably, only 12% of respondents say their current approach is sufficient. The industry is not unaware of its gaps. The challenge is prioritization and investment in the execution infrastructure that turns plans into consistent action.

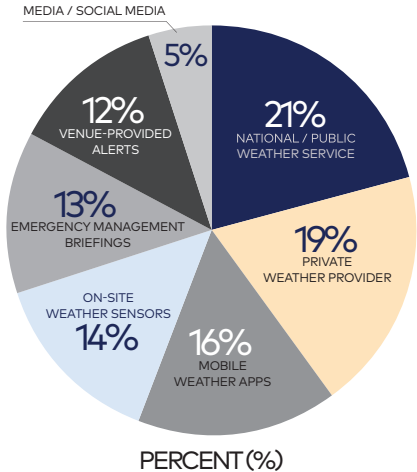
This indicates that the primary gap is not planning, but the ability to operationalize those plans consistently.

How Weather Intelligence Shapes Decisions

Weather Intelligence Sources

Respondents indicate that event teams rely on multiple sources for weather information but tend to prioritize either a public weather source or a private weather provider as their primary input.

Sources of Weather Intelligence

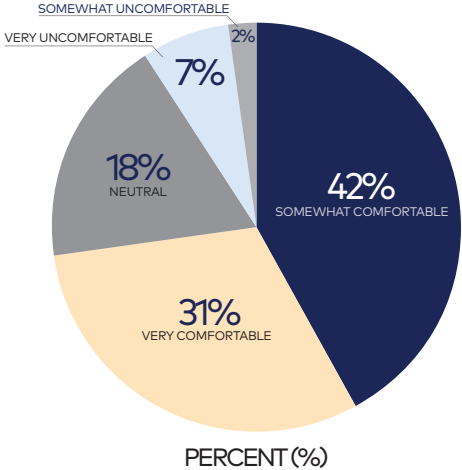


Other sources — such as on-site weather sensors, emergency management briefings, and venue-provided alerts — are closely ranked behind primary providers. While they are less often the top-ranked input, they remain integral to situational awareness and decision-making.

Forecast Interpretation Confidence

Survey respondents represent experienced professionals across the event industry, with the majority (75%) reporting 15 years or more of involvement in event planning and operations. Despite this level of experience, confidence in applying weather information remains uneven.

Forecast Confidence



Variability in interpretation confidence can introduce additional complexity during time-sensitive or high-pressure situations. When forecast conditions are uncertain, organizations may rely more heavily on consultation, escalation, or additional verification before acting.

This can slow decision-making and contribute to differences in how similar weather conditions are assessed across organizations or event environments.

Viewed more broadly, the findings suggest that weather decision-making is influenced not only by the availability of information, but by the confidence and operational frameworks organizations use to interpret and act on that information.

From Information to Interpretation

The gap between forecast access and forecast confidence is practical. Event organizers are not meteorologists, and forecasts — even accurate ones — require translation into operational terms: what conditions are expected, when and what location, and at what threshold for action.

This may partly explain why, when ranked by primary reliance, event teams most frequently turn to a public service or a private weather provider.

The fact that 65% of respondents involve a weather service or consultant in their decision process reinforces that weather expertise is already embedded in event operations. The question is whether that expertise is consistently translated into operationally actionable decisions.

Additionally, when asked what actions helped avoid cancellation or evacuation, the top answer (61%) said consulting a meteorologist helped them avoid cancellation or evacuation.

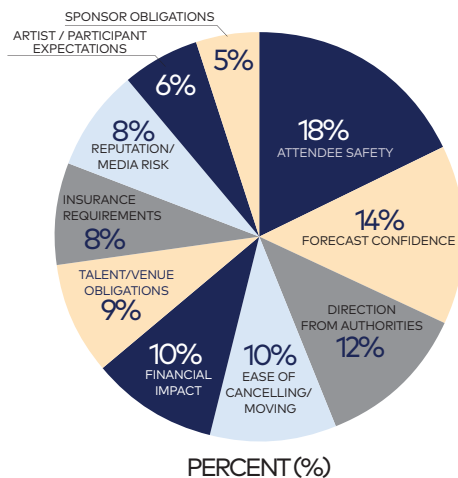
In an industry where confidence gaps are most acute under time pressure, direct access to meteorological expertise already serves as a practical bridge between forecast data and operational action.

61% identify consulting a meteorologist as helping them avoid cancellation or evacuation.

Top Factors Influencing Weather Decisions

Safety is the primary driver of weather-related decision-making in the event industry. While past event tragedies brought greater focus to modern safety protocols, they did not establish safety as a priority. They led to the adoption of more structured protocols, training, and evaluation processes, ensuring that safety remains the top consideration under all conditions.

Factors That Influence Weather Decisions



At the same time, the data show that decisions are not driven by one factor. While a clear hierarchy exists at the aggregate level, with safety at the top, decisions in real-world scenarios are inherently multi-factor. Organizers simultaneously weigh forecast confidence, external guidance, operational feasibility, and financial implications.

Forecast confidence, which accounts for 14% of decision influence, plays a critical role in this process. Decision-makers are not only evaluating weather conditions, but also their confidence in the accuracy and timing of those conditions, often under significant time pressure.

Financial and reputational factors remain meaningful but secondary considerations within a multi-factor decision framework. While they influence decisions, they are not always systematically measured, pointing to a gap in how financial exposure is understood and managed over time.

This is reflected in the 43% of respondents who cannot estimate their weather-related costs, suggesting a gap in how financial exposure is measured over time.

The industry has internalized safety primacy but has not developed equally systematic approaches to quantifying and managing the financial exposure that accumulates around it.

43% of respondents cannot estimate their weather-related costs

Financial Impact

Cost of Weather Disruption

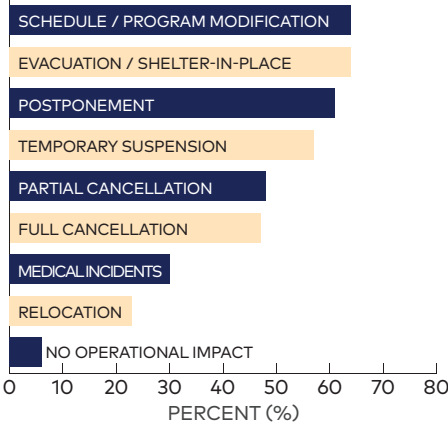
Conventional thinking often frames weather risk primarily in terms of event cancellation.

Findings from this survey suggest a more nuanced reality: The financial impact of weather is driven as much by operational disruption as by cancellation – often more.

Cancellation isn't the real threat, disruption is.

Approximately 94% of respondents report experiencing operational impacts, such as schedule or program modifications, temporary suspensions, or evacuation procedures due to weather.

Weather Disruption Outcomes



Respondents could select multiple responses; percentages do not total 100%.

These disruptions materially alter the trajectory of an event. Shortened programs, delayed starts, or temporary

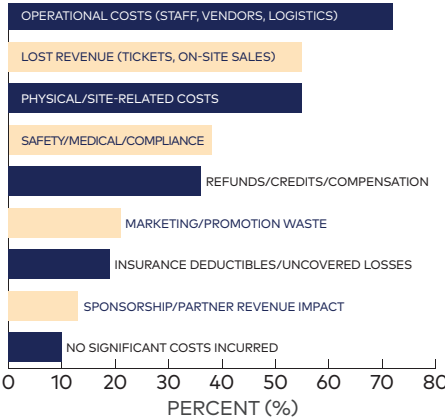
shutdowns reduce attendee engagement, disrupt vendor operations, and degrade the overall experience. While not classified as cancellations, they represent meaningful deviations from planned performance – and, critically, from expected revenue outcomes.

Financial Loss Extends Beyond Cancellations

The cost data reinforces this dynamic. More than half of respondents (55%) report experiencing direct lost revenue due to weather disruptions, including losses from ticket sales, registrations, and on-site purchases.

This suggests that financial impact extends across a range of disruption scenarios and is likely underreported.

Costs Incurred Due To Weather Disruption



Respondents could select multiple responses; percentages do not total 100%.

The Overlap Between Disruption and Revenue Loss

A particularly important insight emerges when examining the overlap between operational disruption and financial outcomes. Approximately 50% of respondents reported experiencing both operational disruptions and lost revenue simultaneously.

Even when events are not canceled, they frequently fail to achieve their expected economic outcomes. This challenges the traditional risk model, which tends to focus on cancellation as the primary financial threat.

Instead, the data suggests that partial disruption represents a more common and collectively significant source of financial loss.

Event Size and Disruption

The relationship between disruption and financial impact becomes more pronounced among organizations reporting higher total costs.

Among those reporting weather-related losses exceeding \$100,000 over five years, the financial impact of disruption is substantial.

Segmenting the data by event size reveals an important distinction between how often events are disrupted and how severely those disruptions impact financial outcomes.

Across all event sizes, weather disruption is relatively consistent. Organizations typically report experiencing five to seven weather-impacted events over five years, indicating that exposure to weather is a near-universal condition in the industry.

However, the financial impact of these disruptions varies significantly by event size.

- *Mid-sized events* (500 - 5,000 attendees) show the highest rates of combined disruption and lost revenue, with overlap rates exceeding 60% in some categories.
- *Large-scale events* (50,000+ attendees) show an overlap rate of 42%.
- *Small events* (fewer than 500 attendees) show the lowest rates, approximately 22%.

This divergence suggests that while exposure to weather is broadly consistent, financial vulnerability is not.

Mid-sized events occupy a uniquely exposed position. They are large enough that disruptions carry meaningful financial consequences, yet often lack the infrastructure, contingency planning, and operational resilience of larger events. At the same time, they do not benefit from the flexibility of smaller events, which can more easily adapt or absorb losses.

As a result, mid-sized events are not necessarily disrupted more often, but disruptions are more likely to translate into measurable financial impact, highlighting a gap in how the industry addresses weather risk at this scale.

Approximately 50% of respondents reported experiencing both operational disruptions and lost revenue simultaneously.

Conclusions:

From Forecasts to Decisions

Weather disruption is not an occasional challenge in event operations. It is a recurring and cumulative condition that functions as an operational constraint across the industry.

Events are more often modified, delayed, or suspended than canceled, and financial impact frequently occurs even when events proceed. Over time, these effects accumulate, creating sustained exposure rather than isolated incidents.

Weather is widely recognized as a risk, and most organizations have taken steps to plan for it. Weather data is also broadly accessible. However, planning and information alone do not ensure consistent outcomes.

Variability is driven by how decisions are made in practice. These decisions occur within compressed timeframes, often involve multiple stakeholders, and require alignment under changing

conditions. They depend not only on confidence in the forecast itself, but also on the ability to interpret and apply that information in real time.

This creates a gap between preparation and execution. Organizations may have similar plans and access to the same data yet arrive at different decisions based on how those inputs are translated into action. In this context, consistency becomes a key measure of effectiveness.

Taken together, these findings reinforce a central shift: **the challenge in weather risk management is no longer access to information. It is the ability to apply that information consistently under pressure.**

Despite improved forecasting capabilities and increased awareness, this gap between information and execution remains a defining characteristic of how weather impacts events today.

Directional Considerations

While the survey does not prescribe specific approaches, the findings point to several areas of focus:

- *Defining decision thresholds that link forecast conditions to specific actions*
- *Clarifying roles and authority to support timely decision-making*
- *Strengthening interpretation of weather information in operational terms to ensure data is translated into the language of event operations*
- *Improving coordination across stakeholders where decision-making is shared*
- *Developing systematic approaches to financial impact quantification, so that the full cost of weather disruption is visible and can inform investment in risk management capabilities*

About the Study

This report is based on a survey of 135 event industry professionals, administered globally in collaboration with the Event Safety Alliance, Global Crowd Management Alliance (GCMA) and United Kingdom Crowd Management Association (UKCMA).

Respondents

The findings in this report are shaped by professionals who are deeply embedded in the day-to-day realities of event operations.

A significant majority of respondents bring long-term industry experience:

- 72% have more than 15 years in the event industry
- An additional 17% have between 8 and 15 years of experience

This level of tenure matters. They are individuals who have managed events across varying conditions, locations, and levels of complexity, and who have repeatedly navigated weather-related challenges over time.

Operational Roles

Respondents represent a mix of strategic and operational roles, offering insight into how decisions are both made and executed, including:

- Event directors and executive producers
- Risk and compliance managers
- Production and technical directors
- Venue and operations managers

Together, these roles span the full lifecycle of event execution, from planning and risk assessment to on-site operations and real-time decision making.

This breadth is important. Weather decisions are rarely confined to a single role. They require coordination across functions, and the dataset reflects that shared responsibility.

Event Size

Respondents manage events across a wide range of sizes, from smaller gatherings to large-scale productions.

- Approximately 50% manage events with 10,000 or more attendees
- 19% manage events exceeding 50,000 attendees

At this scale, weather decisions carry amplified consequences. Impacts extend beyond scheduling to include safety, logistics, financial exposure, and stakeholder coordination.

Large-scale events also involve more stakeholders, including public safety agencies, vendors, sponsors, and insurers. This increases the complexity of decision alignment.

Geography

The majority of respondents (74%) operate in North America, with additional representation from organizations managing events across multiple global regions, as well as Europe, the UK, and other international markets.

While the findings are most directly reflective of North American operating conditions, they are informed by organizations working across different regulatory environments and geographies.

Readers operating primarily in non-North American contexts may find that some patterns differ from their own experience.

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