

Stadium Crowd Flow Bottlenecks Deck

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1. Why Crowd Flow Bottlenecks Break Stadiums at Scale

WHY CROWD FLOW BOTTLENECKS BREAK STADIUMS AT SCALE

Modern stadiums are engineered for scale. But their biggest weakness isn't capacity. It's flow.



Because no matter how large a venue is, if people cannot move efficiently through it, **the entire operation breaks down.**



Crowd flow — not crowd size — determines whether a stadium works or fails. **And at scale, even small inefficiencies turn into major bottlenecks.**

HOW BOTTLENECKS BREAK STADIUM OPERATIONS

1 DEMAND CONVERGES



Thousands of fans arrive within a short time window.
Demand spikes.

2 PEOPLE HIT CONSTRAINTS



Limited entry lanes, security checks, bag handling, stairs, concessions, toilets.
Capacity is limited.

3 QUEUES FORM AND GROW



Queues expand upstream and spill out.
Flow slows down.

4 DELAYS CASCADE



Late entry, missed kick-off, overloaded amenities, frustrated fans and staff.
Experience suffers.

5 SYSTEM BREAKS DOWN



Safety risks increase. Operations scramble. Reputation and revenue take a hit.
Stadium fails to perform.

WHY IT GETS WORSE AT SCALE



ARRIVAL BURSTS
Larger events create bigger, sharper peaks in demand.



FEWER RELATIVE ENTRY POINTS
Entry points don't scale proportionally with capacity, reducing flow per m².



HUMAN BEHAVIOUR
People bunch, follow crowds, and choose the same obvious routes.



SMALL FRICTION, BIG IMPACT
A 5-second delay per person becomes hours of delay across thousands.



RISK MULTIPLIES
Congestion leads to safety issues, non-compliance and operational failure.



THE BOTTOM LINE

Stadiums are only as strong as their flow. Design for flow. Remove bottlenecks. Protect the experience.



SMOOTHER FLOW



SAFER EVENTS



HAPPIER FANS



BETTER PERFORMANCE



STRONGER ROI

2. What Are Crowd Flow Bottlenecks in Stadiums?

WHAT ARE CROWD FLOW BOTTLENECKS IN STADIUMS?

Crowd flow bottlenecks occur when the movement of people is restricted at key points in a venue.

KEY BOTTLENECK POINTS IN A STADIUM

<p>1</p> <p>ENTRANCES</p> <p>Limited capacity at initial venue.</p>	<p>2</p> <p>SECURITY CHECKPOINTS</p> <p>Bag checks and screening require time and space. Bags are the #1 cause of delay.</p>	<p>3</p> <p>TURNSTILES</p> <p>Limited lanes and slow processing create queues that spill back and compound.</p>	<p>4</p> <p>CONCOURSE ACCESS POINTS</p> <p>Choke points at stairwells, ramps, and concourse junctions restrict movement between areas.</p>	<p>5</p> <p>FOOD & DRINK</p> <p>Limited service points cannot handle peak demand, causing long waits and blocking flow.</p>	<p>6</p> <p>RESTROOMS</p> <p>High demand and limited facilities lead to queues that disrupt flow in surrounding areas.</p>	<p>7</p> <p>EXIT</p> <p>Bottlenecks at exits in clearances can be a safety risk.</p>
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BOTTLENECKS FORM

Large volumes of people converge at a limited point.

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Limited capacity cannot process everyone quickly.

↓

Queues form and grow, spilling into upstream areas.

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Delays flow across the venue, impacting multiple systems.



WHEN FLOW SLOWS AT ANY ONE POINT, IT CREATES:

- CONGESTION**
Crowds pack into spaces, reducing comfort and safety.
- DELAYS**
Longer wait times at entry to the event.
- QUEUE BUILDUP**
Queues grow, spill into other areas, and block other areas.
- SAFETY RISKS**
Increased pressure and higher risk of injury.

CROWD FLOW IS THE LIFEBLOOD OF STADIUM OPERATIONS.
IDENTIFY. MANAGE. REMOVE BOTTLENECKS. KEEP PEOPLE MOVING.

SMOOTHER EXPERIENCE
 Happier fans. Better atmosphere.

IMPROVED SAFETY
 Lower risk. Safer environment.

HIGHER REVENUE
 More time in venue. More spent.

EFFICIENT
 Better. Stronger.

3. Bags Disrupt Movement Everywhere

BAGS DISRUPT MOVEMENT EVERYWHERE

Bags don't just impact entry — they affect the entire stadium.



BAGS INTRODUCE FRICTION AT EVERY STAGE OF THE VISITOR JOURNEY.



SLOWER FLOW
More time per person at every touchpoint.



MORE CONGESTION
Less space, fewer options, more bottlenecks.



LONGER DWELL TIMES
Delays compound across the entire experience.



HIGHER RISK
Crowd density and frustration increase safety risks.

HOW BAGS DISRUPT MOVEMENT ACROSS THE STADIUM

1 SLOWER SECURITY CHECKS



- Bags require manual inspection.
- Slower processing per visitor.
- Longer queues, frustrated fans.

2 MORE SPACE REQUIRED IN SEATING AREAS



- Bags take up valuable seat and foot space.
- Less comfort for everyone.
- Reduced capacity potential.

3 CONGESTION IN AISLES AND WALKWAYS



- Bags make movement slower and less predictable.
- Aisles become choke points.
- Flow breakdowns cause upstream delays.

4 INCREASED DWELL TIME AT ENTRY AND ACCESS POINTS



- Bags slow every interaction.
- More time at gates, bars, concessions, and restrooms.
- Delays ripple across the venue.



BAGS CREATE FRICTION. FRICTION CREATES FAILURES.



MORE FRICTION



SLOWER FLOW



MORE CONGESTION



HIGHER RISK



WORSE EXPERIENCE



LOWER REVENUE



REMOVE THE BAG. REMOVE THE BOTTLENECK. IMPROVE FLOW AT EVERY STAGE.



4. The Hidden Risks of Crowd Flow Bottlenecks

THE HIDDEN RISKS OF CROWD FLOW BOTTLENECKS

When people can't move freely, risks escalate quickly — with serious consequences.



**POOR CROWD FLOW
ISN'T JUST INCONVENIENT.
IT'S DANGEROUS.**



BOTTLENECKS TURN CROWDS INTO RISKS.



SAFETY & COMPLIANCE RISK

Poor crowd flow creates:



HIGH-DENSITY PINCH ZONES

Too many people in
too little space.



RESTRICTED MOVEMENT IN EMERGENCIES

Choke points block
escape routes.



DELAYED EVACUATION CAPABILITY

Seconds lost can
cost lives.

CRITICAL UNDER MODERN REGULATIONS



Martyn's Law and other
safety legislation require
venues to proactively
manage crowd risks.

WHAT CAN GO WRONG



CRUSH & INJURY RISK



High-density conditions can lead
to crushing, falls, and serious injury.



PANIC & LOSS OF CONTROL



Bottlenecks increase panic
potential and reduce control.



EVACUATION FAILURE



Blocked or slow movement can
delay evacuation when it matters
most.



REPUTATION DAMAGE



Incidents lead to negative media,
loss of trust, and long-term
reputational harm.



LEGAL & FINANCIAL CONSEQUENCES



Fines, legal action, and increased
insurance costs can severely
impact your bottom line.



THE BOTTOM LINE

BOTTLENECKS don't just slow
operations down.

**THEY PUT LIVES,
REPUTATIONS,
AND BUSINESSES
AT RISK.**



**SAFE FLOW SAVES LIVES.
SMART FLOW PROTECTS
EVERYTHING.**



**PROACTIVE FLOW MANAGEMENT IS NOT OPTIONAL.
IT'S A LEGAL, ETHICAL, AND OPERATIONAL NECESSITY.**



DESIGN FOR FLOW



IDENTIFY RISKS



REMOVE BOTTLENECKS



PROTECT PEOPLE

Because when
flow fails, so does
everything else.

5. Static Infrastructure Meets Dynamic Demand

STATIC INFRASTRUCTURE MEETS DYNAMIC DEMAND

Stadiums are fixed structures. But crowd behaviour is unpredictable.

STATIC INFRASTRUCTURE – FIXED BY DESIGN



BUILT TO LAST

Stadiums are designed years in advance.



FIXED CAPACITY POINTS

Entrances, concourses, stairs, and amenities cannot expand.



PHYSICAL LIMITS

Walls, columns, and layouts don't change.



DESIGNED FOR AVERAGE

Built around historical data and expected demand.



DYNAMIC DEMAND – UNPREDICTABLE BY NATURE



BEHAVIOUR CHANGES

Arrival times, movements, and decisions vary constantly.



PEAKS ARE UNPREDICTABLE

Surges happen suddenly and unevenly.



EVENTS ARE UNIQUE

Different opponents, days, weather, and stakes drive different patterns.



EMOTIONS DRIVE MOVEMENT

Excitement, delays, and reactions create unpredictable flows.

THE MISMATCH LEADS TO:



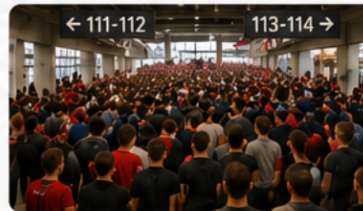
UNDERUTILISED AREAS IN SOME ZONES



- Concessions and facilities sit idle
- Revenue opportunities are missed
- Space is not used efficiently



SEVERE OVERCROWDING IN OTHERS



- Long queues and congestion
- Safety risks increase
- Comfort and experience suffer



POOR DISTRIBUTION OF PEOPLE



- Uneven pressure on infrastructure
- Operational strain on staff and systems
- Harder to manage and respond



THE RESULT

- Congestion where it matters most
- Underuse where it could create value
- Frustrated fans and overworked operations
- Reduced safety, satisfaction, and revenue



THE SOLUTION

Design systems that add flexibility to fixed infrastructure. Enable people to move, spread, and self-manage. Create flow that adapts to demand in real time.



BETTER FLOW DISTRIBUTION



LOWER RISK & CONGESTION



HIGHER REVENUE OPPORTUNITY



HAPPIER FANS, BETTER EXPERIENCE



INFRASTRUCTURE SETS THE LIMITS. FLOW DETERMINES THE OUTCOME.

BRIDGE THE GAP. MAKE EVERY SPACE WORK HARDER.

6. The Core Problem: Friction in Movement

THE CORE PROBLEM: FRICTION IN MOVEMENT

Crowd flow bottlenecks are caused by friction points.



SECURITY CHECKS



Time-intensive checks create long queues.



BAG HANDLING



Bags require inspection, space and extra handling.



NARROW ACCESS ROUTES



Limited width and pinch points restrict movement capacity.



MANUAL PROCESSES



Manual steps slow down throughput and increase delays.



AT SCALE: EVEN SMALL INCREASES IN FRICTION CREATE **EXPONENTIAL CONGESTION.**



THE BIGGEST HIDDEN BOTTLENECK: BAG HANDLING

Across stadiums globally, one factor consistently disrupts flow:

BAGS.



SLOW DOWN ENTRY PROCESSING

More time per visitor means fewer people get through.



INCREASE SPACE USAGE

Bags take up space at checks, in queues and in seating areas.



CREATE SECONDARY QUEUES

Bag drop-off, re-checks and retrieval create extra congestion.



REDUCE MOVEMENT SPEED INSIDE THE VENUE

Carrying bags makes movement slower and less efficient.



**REMOVE THE BAG PROBLEM...
...AND YOU REMOVE A MAJOR SOURCE OF CONGESTION.**

THE RISKS IF FRICTION ISN'T ADDRESSED



SAFETY RISK

Congested areas increase the risk of incidents and reduce the ability to evacuate safely.



REVENUE LOSS

When movement is restricted, visitors avoid concessions and premium experiences, reducing spend.



POOR FAN EXPERIENCE

Delays, frustration and missed moments lead to negative perceptions and lower likelihood of return.



OPERATIONAL STRAIN

More staff, temporary fixes and reactive measures increase cost without solving the root cause.



REDUCING FRICTION IS THE FASTEST WAY TO IMPROVE FLOW, SAFETY, EXPERIENCE AND REVENUE.

7. The Scalable Solution: Design Flow, Don't Manage It

THE SCALABLE SOLUTION: DESIGN FLOW, DON'T MANAGE IT

The most effective stadiums don't try to manage congestion. They design it out of the system.



✓ PRE-ENTRY SMART LOCKER SYSTEMS

Smart lockers transform flow by removing bags before entry.

- FASTER SECURITY CHECKS**
Fewer bags = faster screening
Increased throughput.
- ELIMINATING CLOAKROOM CONGESTION**
No queues.
No manual handling.
- ENABLING DISTRIBUTED STORAGE**
Storage close to entry points
reduces pressure on key areas.
- IMPROVING INTERNAL MOVEMENT**
Less congestion in aisles
and concourses.

✓ INCREASING EFFECTIVE CAPACITY WITHOUT EXPANDING INFRASTRUCTURE

By reducing friction:

- More people move through existing spaces.
- Flow becomes smoother and more predictable.
- Bottlenecks are minimised.

REAL IMPACT ON STADIUM OPERATIONS

With optimised flow systems:

<p>ENTRY SPEEDS INCREASE SIGNIFICANTLY More fans in, faster and safer.</p>	<p>CONGESTION HOTSPOTS REDUCE Flow is balanced across the venue.</p>	<p>SAFETY IMPROVES Lower density, better circulation, faster response.</p>	<p>REVENUE PER FAN INCREASES More spend on food, beverage and retail.</p>	<p>STAFF REQUIREMENTS DECREASE Less manual work. Lower operating costs.</p>	<p>SEE: /solutions/event-smart-lockers/</p> <p>COMPARE: /cloakrooms-vs-lockers-event-security/</p> <p>CALCULATE ROI: /roi-calculator/</p>
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THE BOTTOM LINE

Stadium bottlenecks are not caused by crowd size. They are caused by poor flow design.

<p>AT SCALE:</p> <ul style="list-style-type: none"> Movement becomes constrained. Bottlenecks cascade. Risk increases. 	<p> The solution is not to control crowds more tightly. It's to remove friction and enable continuous flow.</p>	<p>MANAGE CONGESTION</p> <ul style="list-style-type: none"> React to problems Temporary fixes Higher cost Lower fan satisfaction 	<p>DESIGN FLOW</p> <ul style="list-style-type: none"> Remove friction Continuous flow Lower cost Happier fans
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BETTER FLOW. SAFER VENUES. HAPPIER FANS. STRONGER RESULTS.
DESIGN FLOW. UNLOCK PERFORMANCE.

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