TECHNOLOGY ASSESSMENT FOR
BRISBANE 2032
OLYMPICS & PARALYMPICS

IS534:INFORMATION CONSULTING (TEAM 1)

APRIL 14TH 2025

AGENDA – TABLE OF CONTENTS

BRISBANE 2032 TECHNOLOGICAL PAIN POINTS

WHAT ARE THE MAJOR PAIN POINTS FOR BRISBANE 2025?

Assessing Brisbane's preparedness to deliver scalable, secure, and inclusive AI-driven infrastructure for the Olympic Games.

Simulation Accuracy and Calibration

Brisbane must ensure AI simulations reflect local crowd behavior, weather, and infrastructure dynamics. Generic models risk planning failures in evacuation, mobility, and stadium layouts. Data from pilot events and urban sensors should inform real-time recalibration for greater reliability.

Digital Twin Integration for Legacy Planning

Digital twins must extend beyond operational modeling to simulate post-Games reuse of venues. Brisbane currently lacks mature planning frameworks to integrate housing, sustainability, and urban regeneration into long-term digital twin applications.

Cloud Infrastructure Scalability

Olympic-scale operations will stress Brisbane's cloud systems. Real-time data from ticketing, surveillance, and athlete services demands resilient cloud architectures with edge computing and redundancy to prevent downtime or latency during peak loads.

Mobility Coordination in a Radial City

Brisbane's radial transport design poses challenges for crowd flow and last-mile movement. AI-based traffic management must integrate multimodal systems to prevent congestion and enable real-time adjustments during high-traffic Olympic periods.

Integration of Temporary and Permanent Venues

Brisbane's reliance on temporary and reused venues risks disjointed infrastructure planning. AI-supported generative design tools are needed to optimize layout integration, ensure safety, and maintain long-term spatial coherence across Olympic zones.

AI Security, Privacy, and Ethics Compliance

AI-driven systems handling biometric and health data must comply with Australian and international privacy laws. Ethical oversight, data protection, and human-in-the-loop protocols are essential to safeguard user trust and institutional accountability.

Up next: *A closer examination of the proposed solutions and how they address Brisbane's most pressing Olympic technology challenges.*

SIMULATION ACCURACY AND CALIBRATION

Assessing Brisbane's preparedness to deliver scalable, secure, and inclusive AI-driven infrastructure for the Olympic Games.

Why This Matters for Brisbane 2032

As the Brisbane 2032 Olympic Games approach, AI simulations are expected to shape critical infrastructure decisions—ranging from stadium layout and transport design to emergency evacuation planning. However, if these simulations are based on generic assumptions rather than localized behavioral, environmental, and urban data, the results may misguide planners, risking congestion, safety hazards, and misaligned infrastructure investments.

Simulations must be continuously calibrated using Brisbane-specific inputs, real-time feedback from urban sensors, and learnings from test events to ensure that every AI output is rooted in **on-ground realities**. The key elements of this can be studied in the adjacent table.

Localized Data Inputs

- Train simulations using Brisbane Metro transit logs, stadium gate scans, and crowd behavior at recent test events (e.g., AFL finals at The Gabba).
- Account for seasonal variables: high humidity, increased medical risk during summer, slower movement during downpours.

Crowd Behavior Differentiation

- Differentiate between tourist groups, local commuters, volunteers, and athletes.
- Calibrate simulations to reflect varying navigation speeds, decision-making delays, and crowding tolerances.

Real-Time Feedback Loops

- Feed sensor data (CCTV, footfall counters, thermal cameras) into simulation engines during pre-Games events.
- Integrate drone-based aerial crowd analysis and anomaly detection to fine-tune model parameters continuously.

Scenario & Stress Testing

- Simulate contingencies: delayed shuttles, medical emergencies mid-crowd, power outages in temporary venues, or accessible evacuation for differently-abled individuals.
- Use probabilistic modeling (Monte Carlo simulations) to explore "what-if" stress points.

Strategic Recommendations

- **Adopt Adaptive Simulation Architecture:** Choose tools that allow ongoing input during the Games to support live recalibration.
- **Institutionalize Simulation Reviews:** Include simulation validation as part of all venue design, transport mapping, and emergency planning phases.
- **Engage Local Behavior Researchers:** Partner with psychology and urban behavior teams at Queensland universities to reflect regional behavior.
- **Mandate Edge Case Scenarios:** Require every venue plan to include alternate simulation outcomes for extreme heat, staff shortage, or multi-hour delays.

For Brisbane 2032, simulation isn't just about modeling the Games—it's about learning from the city itself. Calibrated, adaptive simulations will empower smarter layouts, safer decisions, and a more seamless Olympic experience for all.

DIGITAL TWIN INTEGRATION FOR LEGACY PLANNING

Building Post-Games Value Through Data-Driven Venue and Urban Transformation

Why This Matters for Brisbane 2032

While digital twins are commonly used for real-time operations during mega-events, their full potential lies in shaping the long-term legacy of Olympic infrastructure. Brisbane, with multiple permanent venues and Olympic villages under development, must go beyond construction-phase modeling and use digital twins to simulate post-Games transformation, including housing conversion, urban regeneration, and energy optimization.

Without strategic integration of twin technologies into legacy planning, Brisbane risks creating underutilized or unsustainable assets post-2032.

Lifecycle-Driven Twin Design

Digital twins should simulate the full asset lifecycle—from Olympic-time operations to post-Games conversion—enabling planners to test and validate long-term reuse strategies like housing, sports clubs, or public spaces.

Integrated Urban Data Infrastructure

Brisbane must connect transport, housing, and sustainability datasets within one twin platform to model realistic urban outcomes, identify interdependencies, and guide cross-sector planning decisions.

Scenario-Based Legacy Planning

Each major venue should be modeled across multiple reuse pathways, with AI assessing cost, environmental impact, and community value to support policy-aligned legacy outcomes.

Public Engagement Through Twin Interfaces

Twin platforms should include interactive tools—like VR fly-throughs or community polling—to involve citizens in legacy planning, enhancing transparency and civic support.

Strategic Recommendations

- **Mandate Digital Twin-Backed Legacy Plans:** Every venue proposal must include post-2032 usage scenarios modeled with digital twins and assessed for long-term social and financial value.
- **Create a Central Twin Governance Framework:** Establish an inter-agency platform to share twin data between transport, housing, sport, and sustainability departments.
- **Integrate Community Co-Design Tools:** Use participatory twin interfaces to collect citizen feedback on venue reuse (e.g., sports complex vs. public library).
- **Track Lifecycle Emissions:** Embed energy, HVAC, and carbon tracking into each venue's twin to plan retrofits for net-zero targets.

Legacy begins before the Games do. With digital twins, Brisbane can plan for what's next—not just what's now—ensuring every Olympic asset becomes a long-term civic asset.

CLOUD INFRASTRUCTURE SCALABILITY

Ensuring Resilient, Real-Time Performance at Olympic Scale

Why This Matters for Brisbane 2032

Brisbane 2032 will rely on cloud-based systems to run real-time Olympic operations—ticket validation, surveillance analytics, athlete tracking, logistics coordination, mobile apps, live scoring, and international broadcasting. These services must be delivered simultaneously, at scale, and with minimal latency. Any failure during peak load moments could disrupt services across venues, compromise safety systems, or erode user confidence.

Scalability, edge deployment, and system redundancy are non-negotiable pillars of Olympic cloud design.

Hybrid Cloud with Edge Capability

Brisbane must deploy a hybrid cloud strategy combining centralized compute (e.g., Azure, AWS) with localized edge nodes at major venues to minimize latency and localize risk.

Auto-Scaling & Load Balancing Architecture

All core applications must support elastic scaling and AI-based load balancing to handle peak concurrency scenarios across apps, entry systems, and live dashboards.

Distributed Redundancy & Failover Systems

Cloud environments should feature mirrored failover paths for mission-critical operations like surveillance, emergency services, and ticket scanning—ensuring zero service interruption.

Tiered Data Strategy

Real-time, near-real-time, and batch data should be processed differently, prioritizing critical services (e.g., access, safety) over less time-sensitive content like archival media analytics.

Strategic Recommendations

- Partner with leading cloud providers (e.g., AWS, Azure, Oracle Cloud) offering proven high-concurrency event support.
- Use local telecom providers (e.g., Telstra) for 5G-enabled edge infrastructure at venues.
- Conduct full-scale pre-Games stress testing, simulating game-day traffic, outage scenarios, and live multi-venue loads.
- Implement a central Cloud Operations Command Center to oversee orchestration, alerting, and failover response.

At Brisbane 2032, milliseconds matter. Building resilient, scalable cloud systems is the foundation for every Olympic interaction—from the ticket gate to the broadcast booth.

MOBILITY COORDINATION IN A RADIAL CITY

Solving Olympic-Scale Movement in a Structurally Constrained Urban Form

Why This Matters for Brisbane 2032

Brisbane's urban layout is structured in a radial (nuclear) format, meaning transport and traffic naturally converge toward the city center. While effective for a mid-size city, this design presents serious challenges for Olympic-scale crowd management—especially when dispersing thousands of spectators, athletes, and staff across multiple venues in short time frames.

To avoid severe congestion, delays, and negative public perception, Brisbane must deploy AI-driven multimodal mobility systems that dynamically adapt to crowd flow and network strain.

AI-Based Multimodal Traffic Control

Use real-time data to adjust vehicle frequencies, reroute traffic, and balance demand across transport types. AI must coordinate ferries, buses, trams, and ride-shares to avoid congestion near venues.

Live Journey Planning Tools

Olympic apps should offer real-time route optimization based on congestion data, entry gate load, and crowd density—pushing personalized, time-sensitive travel guidance to spectators and staff.

Pedestrian Flow Forecasting

Implement crowd density sensors and CV analytics to forecast bottlenecks and redirect movement through alternative footpaths or staging areas.

Unified Mobility Dashboard

All public and private transport providers must share data within a centralized AI dashboard, enabling the Olympic Command Center to act on predictive insights instantly.

Strategic Recommendations

- Partner with transit authorities (Translink, Brisbane Metro) to integrate fare, location, and capacity data into an AI mobility layer.
- Deploy predictive foot traffic sensors and crowd analytics at all major transport nodes and Olympic venues.
- Pilot dynamic routing systems (temporary shuttle hubs, flex-lane allocation) during test events in 2028–2030.
- Launch a unified mobility app with live navigation, alerts, and congestion avoidance for all Olympic attendees.

Mobility is the heartbeat of the Olympic experience. Brisbane must turn its radial challenge into a responsive, intelligent transport ecosystem—powered by AI and designed for fluid, city-wide motion.

INTEGRATION OF TEMPORARY AND PERMANENT VENUES

Designing Spatial Continuity Across Short-Term Infrastructure and Long-Term Urban Assets

Why This Matters for Brisbane 2032

Brisbane's bid for the 2032 Olympics is rooted in sustainability and cost-efficiency—with 84% of venues either reused or temporary. While this minimizes construction waste and financial burden, it introduces a significant challenge: coordinating temporary and permanent infrastructure to ensure seamless urban functionality, visitor experience, and post-Games legacy value.

Without cohesive spatial integration, Brisbane risks producing fragmented venue layouts, inconsistent user flows, and logistical inefficiencies across Olympic zones.

Layout Optimization

Leverage AI tools (e.g., Autodesk Spacemaker, Sidewalk Labs) to test thousands of layout options that maximize spatial continuity, reduce conflict zones, and improve accessibility across zones.

Integrated Overlay and Legacy Zoning

Overlay temporary infrastructure with zoning pathways for future community projects. Use digital twin technology to simulate "post-Games morphing" of space.

Modular and Sustainable Architecture

Use prefabricated, low-carbon, and reusable structures for temporary venues that can be dismantled without damaging surrounding infrastructure or environment.

Cross-Functional Planning Teams

Include architects, urban planners, security personnel, and legacy specialists in venue design from day one to avoid siloed decisions that disrupt long-term coherence.

Strategic Recommendations

- Require all venue proposals to include an integration audit: how will temporary structures interact with transport, crowd flow, and post-Games plans?
- Adopt AI generative planning software for layout testing and design refinement across Olympic zones.
- Pilot community-centric post-use concepts—turn temporary stadium sites into public plazas, green zones, or temporary marketplaces within a 3-year window.
- Include overlay plans and deconstruction logistics in city permits and infrastructure blueprints.

Temporary doesn't mean disconnected. With AI-supported planning, Brisbane can align short-term Olympic needs with long-term urban form—creating infrastructure that evolves, not evaporates.

AI SECURITY, PRIVACY, AND ETHICS COMPLIANCE

Building Trustworthy Systems to Power a Secure Olympic Experience

Why This Matters for Brisbane 2032

AI will play a central role in Brisbane 2032's operations—powering surveillance, biometric access, health monitoring, crowd analytics, and predictive response systems. These applications will collect and process highly sensitive personal data from athletes, spectators, staff, and international visitors.

Without robust compliance with Australian and international data protection laws, Brisbane risks:

- Legal liability,
- Public backlash, and
- Irreversible loss of institutional trust.

AI systems must be transparent, secure, and ethically governed.

Privacy-by-Design AI Frameworks

AI tools must minimize data collection, store only necessary information, and ensure secure encryption across endpoints. Consent protocols must be embedded at data entry points.

AI Explainability and Human Oversight

Decisions made by AI (e.g., access denial, crowd warnings) must be explainable and subject to human override. Systems should provide transparency logs and justifications for actions.

Cross-Border Compliance & Data Residency

Athlete and attendee data will span jurisdictions. Brisbane must ensure compliance with GDPR (EU), APEC Privacy Framework, and Australia's Privacy Act through localized storage and consent mechanisms.

Independent Ethics and Audit Panels

Brisbane should establish an Olympic AI Ethics Committee, including legal, technical, and civic experts, to oversee algorithmic accountability, fairness, and risk mitigation.

Strategic Recommendations

- Mandate Privacy Impact Assessments (PIAs) for all AI deployments before operational rollout.
- Implement data minimization principles, ensuring only essential data is collected and retained.Partner with the Office of the Australian Information Commissioner (OAIC) for privacy compliance review.
- Create a real-time AI ethics dashboard, showing system usage, alerts, interventions, and performance.
- Run cybersecurity drills and third-party audits in advance of the Games to stress-test data systems.

AI must be powerful—but it must also be principled. For Brisbane 2032 to succeed, its systems must not only perform, but also protect the people they serve.

BRISBANE 2032 PROPOSED TECHNOLOGY

WHAT MAKES PROPOSED TECHNOLOGIES WORK ?

Brisbane 2032 seeks to redefine Olympic planning and execution through smart, adaptive technologies.

Predictive Analytics & Machine Learning
Expected to forecast ticket sales, transportation demand, and accommodation needs using historical and live data. Could enable dynamic pricing strategies and real-time resource allocation during peak event periods.

Cloud-Based AI Infrastructure
Planned to support real-time systems including ticketing, surveillance, fan applications, and live data streaming. Will offer scalability and resilience to handle peak digital traffic across venues and operational networks.

AI-Powered Simulation
Will be used to digitally model crowd dynamics, transport flow, and emergency scenarios to inform venue and city planning.
Aims to optimize safety protocols and reduce logistical bottlenecks through predictive scenario testing.

Smart City Management Systems
Designed to unify control of transport, utilities, and emergency response through IoT-connected infrastructure. Intended to streamline operations, improve service coordination, and enhance sustainability outcomes during the Games

Digital Twin Technology
Proposed to simulate venue usage, energy consumption, and stress testing of Olympic infrastructure.
May assist in evaluating legacy use scenarios, such as converting athlete villages into public housing.

WHAT MAKES PROPOSED TECHNOLOGIES WORK ?

AI – Powered Simulation

AI-powered simulation enables real-time scenario modelling for crowd movement, transportation, and emergency responses. These simulations help inform infrastructure planning, operational safety, and user experience before physical deployment.

Predictive Analytics & Machine Learning

Predictive analytics leverages historical and real-time data to forecast demand, resource usage, and behavioural trends. It supports smarter, more responsive operations during high-density events.

Use cases – Brisbane 2032 Applications

1. **Crowd Flow Modelling:** Simulate spectator movement through stadiums, entry gates, and concourses to predict congestion points. This supports layout refinement to improve overall crowd throughput.
2. **Infrastructure Optimization:** Analyse how different configurations (e.g., restroom locations or signage placement) affect traffic and accessibility in high-density areas.
3. **Evacuation Planning:** Model emergency evacuations based on event schedules and threat types to determine optimal exit routes and safety zone placement.
4. **Transport Hub Simulation:** Evaluate the load on train, bus, and pedestrian routes during peak arrival/departure times to prevent bottlenecks.

1. **Ticket Demand Forecasting:** Use regression and time-series models to predict ticket sales trends and optimize event scheduling. This supports pricing strategy and crowd control.
2. **Dynamic Pricing Algorithms:** Implement ML models that adjust ticket and merchandise prices based on demand signals, competition levels, and inventory turnover.
3. **Staffing Optimization:** Anticipate volunteer no-shows or peak staffing demands using classification models and historical attendance data.
4. **Inventory Forecasting:** Use unsupervised learning to predict food, merchandise, and medical supply needs per venue.

WHAT MAKES PROPOSED TECHNOLOGIES WORK ?

Cloud-Based AI Infrastructure

Cloud infrastructure offers the computational and storage backbone for Olympic operations, enabling fast data processing, system integration, and resilient digital experiences across all user touchpoints.

Digital Twin Technology

Digital twins combine BIM models, sensor feeds, and real-time simulation to create virtual counterparts of physical assets. These systems allow stakeholders to optimize design, monitor performance, and explore legacy options pre- and post-Games.

Use cases – Brisbane 2032 Applications

1. **Digital Ticketing & Access Systems:** Provide a unified cloud backend for QR-based mobile tickets, access control, and session management across venues.
2. **Athlete Monitoring Platforms:** Store and process health, performance, and biometric data to assist medical staff and trainers.
3. **Live Broadcasting & Streaming:** Deliver low-latency, HD-quality streams through edge computing and CDN integration to millions of viewers.
4. **Secure Data Management:** Enforce encryption, identity access control, and compliance (GDPR, ISO 27001) for data collected during the Games.

1. **Venue Simulation:** Model air circulation, lighting systems, crowd capacity, and accessibility in stadiums using integrated digital twin dashboards.
2. **Sustainability Optimization:** Monitor energy usage and predict HVAC or lighting adjustments to reduce environmental load.
3. **Security Simulation:** Test surveillance coverage, emergency exits, and response times in virtual space before deployment.
4. **Post-Games Repurposing:** Simulate long-term use cases such as turning Olympic Villages into residential or mixed-use neighbourhoods.

WHAT MAKES PROPOSED TECHNOLOGIES WORK ?

Smart City Management Systems

Smart city platforms provide unified oversight of transit, utilities, waste, and emergency services using IoT and AI. These systems enable live decision-making and cross-agency coordination at urban scale.

Use cases – Brisbane 2032 Applications

1. **Waste & Utility Automation:** Optimize garbage pickup, water supply, and energy grid performance based on real-time usage and predictive demand.

2. **Crisis Response Management:** Connect emergency responders, hospitals, and traffic authorities into a single system for immediate coordination.

3. **Sustainability Scorecards:** Visualize and track energy usage, CO_2 emissions, and waste generation across Olympic venues.

4. **Mobility Coordination:** Aggregate real-time data from metro, buses, bike sharing, and pedestrian areas to manage crowd flow and reroute traffic when necessary.

TECHNOLOGY-DRIVEN IMPACT MATRIX

Mapping how key smart technologies enhance the Olympic experience for spectators, athletes, city authorities, and local communities.

Spectators

Enhancing experience, accessibility, and safety

- **AI-Powered Simulation:** Predicts and prevents crowd congestion at entry points and transport hubs.
- **Predictive Analytics:** Offers personalized updates (e.g., transport, queues, offers) through mobile apps.
- **Smart City Systems:** Supports real-time navigation and environmental comfort (e.g., cooling, noise).
- **Cloud Infrastructure:** Enables smooth ticketing, mobile wayfinding, and event alerts at scale.

Athletes & Teams

Supporting logistics, safety, and health monitoring

- **Cloud Infrastructure:** Stores biometric, training, and performance data in real time.
- **Predictive Analytics:** Helps in medical forecasting (injury prevention, load management).
- **Smart City Systems:** Ensures optimized athlete transport and emergency access routes.
- **Digital Twins:** Simulates warm-up spaces, track layout, and facility usage for performance optimization.

City Authorities

Coordinating emergency response, transport, and sustainability

- **Smart City Systems:** Centralized control for traffic, utilities, waste, and emergency services.
- **AI Simulation:** Plans and validates crowd management strategies across venues and public spaces.
- **Cloud Infrastructure:** Powers secure data sharing across city departments and agencies.
- **Predictive Analytics:** Anticipates peak demand for police, transit, sanitation, and health resources.

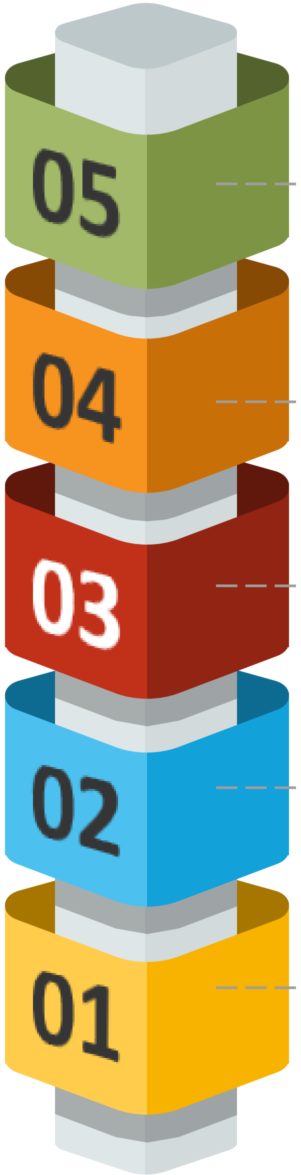
Legacy Communities

Delivering long-term value through reuse and urban innovation

- **Digital Twins:** Guides post-Games conversion of venues into housing, schools, or parks.
- **AI Simulation:** Evaluates urban planning models for future infrastructure needs.
- **Smart City Systems:** Leaves behind digital governance infrastructure for smarter urban services.
- **Cloud Infrastructure:** Scales down for civic use post-Games (public transport, digital ID systems).

WHAT ARE THE RISKS OF THE PROPOSED TECHNOLOGIES?

For Brisbane 2032, emerging technologies must align with the city's infrastructure realities, urban dynamics, and public trust imperatives.



Predictive Analytics & Machine Learning

Urban Context Misalignment: Predictive tools trained on global Olympic datasets may fail to capture Brisbane's radial transport layout, local ticketing patterns, or seasonal visitor behavior—especially during peak summer conditions.
Demand Over/Underestimation: If ML models misread local transport habits or school calendars, Brisbane risks resource misallocation in crowd control and service deployment.
Socioeconomic Sensitivity: Without fairness audits, pricing algorithms could marginalize low-income communities or suburban visitors, sparking public backlash in a city with pronounced economic gradients.

Cloud-Based AI Infrastructure

Edge Latency Across Spread-Out Venues: Brisbane's Olympic venues are distributed across metro and regional Queensland. A purely cloud-centralized system may lag in edge-decision tasks like health alerts or access control in distant hubs (e.g., Gold Coast or Sunshine Coast).
Load Management at Legacy Transit Hubs: Brisbane's existing digital infrastructure (e.g., Central Station, South Bank precinct) may strain under Olympic cloud-service demands, especially without localized data caching or cloud-bursting protocols.
Cross-Border Data Complexity: With international athletes and spectators, data flows may face compliance risks across Australia's Privacy Act, GDPR, and APEC Cross-Border Privacy Rules..

AI-Powered Simulation

Lack of Real-World Calibration: Simulations that don't incorporate Brisbane's climate extremes, river-crossing infrastructure (e.g., Story Bridge), or local commuting norms may yield flawed congestion or emergency evacuation forecasts.
Overdependence on Static Scenarios: If simulations aren't dynamically updated with live test event data from The Gabba or Brisbane Arena, they may miss critical variables—like localized crowd surges during sports with regional appeal.
Blind Spots in Cultural Behavior Modeling: Without integrating Australian event-going habits (e.g., early arrivals, peak-time clustering), simulations may underpredict certain logistical stress points.

Digital Twin Technology

Limited Civic Data Availability: Many Brisbane agencies operate on siloed infrastructure and planning platforms, limiting the real-time data inputs required for effective twin synchronization across Olympic and legacy use cases.
Short-Term Deployment Pressure: With tight timelines and evolving venue designs (e.g., final decisions still pending for Brisbane Arena), digital twins may be rushed—sacrificing model accuracy or cross-agency usability.
Post-Games Decommissioning Risk: Without long-term operational funding or talent pipelines, twins may expire post-Games, limiting their role in guiding civic redevelopment in neighborhoods like Woolloongabba or Victoria Park.

Smart City Management Systems

Coordination Across Distributed Regions: With Olympic activities spreading to Gold Coast, Sunshine Coast, Logan, etc., a lack of a unified control system could fracture emergency and transport responses.
Perceived Overreach in Public Surveillance: As Queensland expands smart surveillance for Olympic security, any lack of transparent usage protocols could trigger privacy pushback—especially in schools, open parks, or waterfront areas.
Ethical Blind Spots in Real-Time Crowd Analytics: If AI is used to detect "unusual behavior" without clear explainability, there's a risk of false alerts or discriminatory profiling, particularly in large, diverse crowd environments..

BRISBANE 2032 CURRENT STATE OF PROPOSED TECHNOLOGY

CURRENT STATE OF THE PROPOSED TECHNOLOGY

Global maturity, real world applications and Brisbane's readiness

	AI Powered Simulations	Predictive Analytics & Machine Learning	Cloud-Based AI Infrastructure	Digital Twin Technology	Smart City Management Systems
Global maturity, real world applications	Used in Tokyo 2020, Changi Airport, and event planning *Supports venue layout, crowd flow modelling, and emergency simulation*	Widely used in sports, transport, and event forecasting (Paris 2024, London 2012) Enables demand prediction, staffing optimization, and dynamic pricing	Used by AWS (FIFA WC 2022), Alibaba Cloud (Olympics), Microsoft (F1) Powers real-time ticketing, live broadcasting, and integrated mobile apps	Helsinki, Paris, and Siemens smart venues Enables virtual testing of venue performance and post-event reuse modelling	Deployed in cities like Singapore and Barcelona with full dashboards Centralizes transport, waste, energy, and emergency response systems
Brisbane's readiness	Early precinct pilots underway Needs expansion across venues and integration with emergency services	Brisbane models are in early design; data infrastructure under development Requires real-time feedback loops and cross-agency data coordination	Brisbane is engaging cloud vendors; basic systems in place Needs scale-up for multi-venue integration and city-wide orchestration	Brisbane pilots active (Gabba, Brisbane Arena), BIM data pipelines in use Requires real-time synchronization and full precinct-level rollout	Brisbane infrastructure partially in place (Cross River Rail, Brisbane Metro) Needs unified Olympic operations centre and inter-agency coordination

Mature & Ready

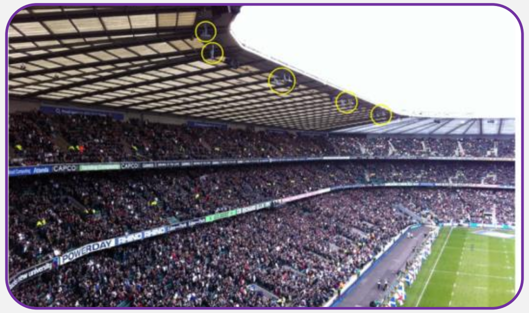
Emerging

Early-Stage

BRISBANE 2032 PREDECESSOR LANDSCAPE & LEARNINGS

HOW DID OUR PREDECESSORS USE SIMILAR TECHNOLOGIES?

London Olympics, 2012



Integrated Technologies:

AnyLogic for venue logistics and crowd simulation

GIS modeling for urban planning and transport coordination

Smart Ticketing infrastructure enabled by Atos and BT

Omega Quantum Timer with starting blocks integrated for sprint start reaction times

Sources: New Developments from London 2012 – IAAF Tech Report

Tested Technologies:

Mobile ticketing platforms integrated via LOCOG and BT

Pervasive sensing for athlete training (via UCL & UK Sport)

Sources: *Delivering London 2012: ICT Enabling the Games*

Delivering London 2012: ICT Enabling the Games.

Institution of Engineering and Technology (IET) publication.

Successes:

Olympic Broadcasting Services (OBS) delivered 5,600 hours of HD content

BBC alone streamed 106 million online video views

Smart City infrastructure allowed efficient data flow across 34 venues

Sources: Delivering London 2012: ICT Enabling the Games

Failures:

Limited post-Games reuse of tech infrastructure (overlay systems removed)

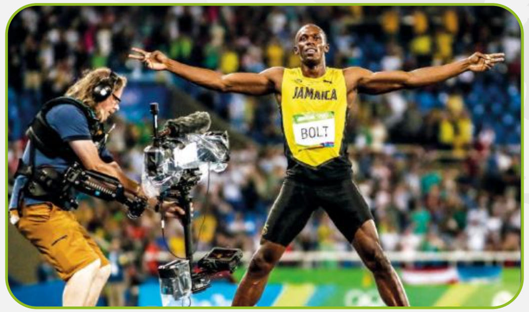
Missed opportunities in live AI-powered analytics for crowd insights

Sources: Delivering London 2012: ICT Enabling the Games

Sources: Delivering London 2012: ICT Enabling the Games

HOW DID OUR PREDECESSORS USE SIMILAR TECHNOLOGIES?

Rio Olympics, 2016



Integrated Technologies:

Real-time Results Distribution System by Atos (broadcast data < 0.5 sec)

Cloud-first infrastructure: Volunteer portal, workforce & accreditation systems

Broadcast innovation via Olympic Broadcasting Services (OBS)

Mobile engagement: Samsung Galaxy Studios and 12,500 custom S7 phones for athletes

Tested Technologies:

Virtual Reality broadcast coverage (85+ hours, 360° video)

Partial 8K Super Hi-Vision trial (live in Japan, down converted for global use)

Public engagement via Samsung VR, McDonald's Youth Program, Coca-Cola Olympic Station

Successes:

OBS delivered 7,100+ hours of HD footage using 1,000+ cameras and drones

Rio 2016: Most digitally consumed Games with 7 billion social media views

Record-breaking coverage: 356,000 hours, 584 channels, 270+ digital platforms

Failures:

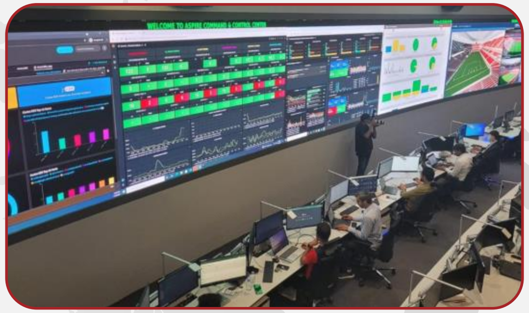
Low legacy value for some mobile infrastructures post-Games

Integration gaps across national and private digital engagement platforms

Unused legacy initiatives in education (Transforma by Dow & Bridgestone)

HOW DID OUR PREDECESSORS USE SIMILAR TECHNOLOGIES?

FIFA World Cup, Qatar 2022



Integrated Technologies:

AI-Powered Ball Tracking: Adidas + Kinexon sensor embedded in match ball (Al Rihla)

Semi-Automated Offside Technology (SAOT): 12 stadium cameras + inertial measurement unit (IMU) inside the ball

Connected Stadiums: 5G-enabled venues powered by Ooredoo and Cisco

Digital Twins Infrastructure: Smart venue management via Aspire Zone Foundation.

Tested Technologies:

Lusail Stadium Cooling System: Targeted air ventilation via solar-powered chillers

Fan Experience via Hayya App: Real-time travel, ticketing, and smart fan ID integration

Successes:

First World Cup with full stadium digital twin integration and AI officiating

Seamless broadcast delivery using cloud and edge computing infrastructure

Extensive VR media content and smart transportation coordination

Failures:

Early-stage integration for AI-driven sustainability dashboards

Data silos between telecom and stadium operation platforms

Where Football Meets the Future – Qatar 2022 Delivered a Seamless Fusion of AI, 5G, and Immersive Fan Technology

HOW DID OUR PREDECESSORS USE SIMILAR TECHNOLOGIES?

Paris Olympics, 2024

Integrated Technologies:

- AI-enhanced OBS broadcasting: multi-camera replay, stroboscopic and motion tracking
- Ultra High Definition (UHD) with immersive 5.1.4 audio and cinematic camera lenses
- Cloud-based broadcasting (OBS Cloud) powered by Alibaba
- AI-assisted data graphics: diving entry, serve speeds, trajectory, and athlete motion

Tested Technologies:

- Virtual Olympic Village experiences using digital twins and AR/VR
- Real-time fan storytelling through automatic highlight reels and social creator partnerships
- Inclusivity: Airbnb partnerships for accessible hosting, Olympic Torch stay at Musée d'Orsay

Successes:

- 11,000+ broadcast hours with record 28.7 billion viewing hours globally
- First Olympics with full 3D broadcast overlays and AI-generated replays
- 12+ billion social media engagements, 5 billion viewers across all platforms

Failures:

- Limited commercial monetization of immersive/creator experiences
- Complexity in integrating AI insights across 30+ partner broadcasters

BRISBANE 2032 LEGAL IMPLICATIONS

WHAT LEGAL IMPLICATIONS SHOULD WE CONSIDER?

Ensuring AI use aligns with legal standards is key to protecting people, infrastructure, and trust during global events.

Security

AI systems will undertake vital functions like crowd monitoring, access control, wearable health information, and hence will be open targets for cyberattacks.

Key Legal Considerations:

- ❑ Liability for data breaches on personal or operational data
- ❑ Protection of infrastructure obligations under national law
- ❑ AI model vulnerability management (adversarial attacks)

Relevant Laws:

- ❑ Australian Security of Critical Infrastructure Act 2018
- ❑ Cybersecurity Strategy 2023–2030 (AU)

Privacy

Since AI collects sensitive data (biometric, facial recognition, medical, behavioral), privacy protection is critical especially because of international participation.

Key Legal Considerations:

- ❑ Consent acquisition: Transparent, informed, withdrawable
- ❑ Restrictions on data use: Purpose-based, time-limited retention
- ❑ Anonymization and pseudonymization of training data for AI

Relevant Laws:

- ❑ Australian Privacy Act 1988
- ❑ General Data Protection Regulation (GDPR) (EU visitors/athletes)
- ❑ IOC Athlete Data Protection Guidelines

Compliance & Transparency

AI decisions regarding resource allocation, ticketing, access, or facility use should be accountable and explainable, especially in the public sector.

Key Legal Considerations:

- ❑ Liability for data breaches on personal or operational data
- ❑ Protection of infrastructure obligations under national law
- ❑ AI model vulnerability management (adversarial attacks)

Relevant Laws:

- ❑ Australian AI Ethics Principles
- ❑ Public Governance, Performance and Accountability (PGPA) Act

WHAT LEGAL IMPLICATIONS SHOULD WE CONSIDER?

Ensuring human oversight, fairness, and accountability in AI-driven decisions is essential to uphold global trust and Olympic values

International Data Jurisdiction

The Olympics involve global citizens. AI systems must respect data protection laws from multiple countries and handle cross-border data transfers lawfully.

Key Legal Considerations:

- ❑ Data residency requirements (e.g., EU data stored in the EU)
- ❑ International data transfer agreements with third-party vendors
- ❑ Consent from international athletes/visitors regarding their data use

Relevant Laws:

- ❑ GDPR, California Consumer Privacy Act (CCPA), APEC Privacy Framework

Accessibility & Inclusion

AI systems used in Brisbane 2032 must be inclusive and non-discriminatory, supporting accessibility for people with disabilities and diverse cultural backgrounds.

Key Legal Considerations:

- ❑ Interfaces (apps, kiosks, bots) must support screen readers, voice input
- ❑ Language and cultural accessibility for international guests
- ❑ Avoid AI model bias in gesture, speech, or facial recognition

Relevant Laws:

- ❑ Disability Discrimination Act 1992 (Australia)
- ❑ Web Content Accessibility Guidelines (WCAG 2.1+)

Ethical AI Use & Human Oversight

AI should not replace human judgment in high-stakes decisions like medical triage, emergency responses, or crowd control predictions.

Key Legal Considerations:

- ❑ Human-in-the-loop safeguards for critical system
- ❑ Bias audits in predictive models
- ❑ Redress mechanisms for users affected by AI decisions

Relevant Laws:

- ❑ *UNESCO AI Ethics Recommendation*
- ❑ *OECD Principles on AI*

BRISBANE 2032 COST OF TECHNOLOGY

TOTAL ESTIMATED COST OF IMPLEMENTING PROPOSED TECHNOLOGIES

Brisbane can implement each smart technology for A$3M–15M, ensuring delivery excellence without compromising budget discipline.

AI-Powered Simulations

The estimated implementation cost for AI-powered simulations ranges from **A$5M to A$10M**, covering full-lifecycle software licenses for tools like Autodesk Forma, AnyLogic, and Bentley OpenBuildings. This also includes technical integration, user training, and long-term support over the course of Olympic planning and operations. Costs also reflect in-house modeling, simulation testing, and scenario design for venues and transport layouts.

Predictive Analytics & Machine Learning

The projected cost for deploying predictive analytics and machine learning platforms is around **A$3.75M–5M**. This includes **A$1M** for cloud-based ML tools like AWS SageMaker and Google Vertex AI, and **A$250K–500K** for analytics dashboard software licenses (Tableau, AWS QuickSight). Personnel and consulting support for data scientists and AI engineers are budgeted at **A$1.5M–3.5M** over the planning period, assuming a 5–6 member team with hybrid vendor/in-house delivery.

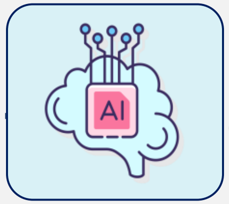
Smart City Management Systems

Smart city systems are estimated to cost **A$3M–6M**, including licenses for platforms like UrbanFootprint, ArcGIS Urban, and OpenAI Codex (**A$1.2M–2M**), IoT deployment for smart waste bins, air quality monitors, and transit sensors (**A$1M–2M**), and dashboard development for civic services and sanitation coordination (**A$400K–800K**). Additional costs include land-use modeling tools (**A$600K–1.2M**) and staff training, analyst support, and platform upkeep (**A$250K–500K**).

Digital - Twin Technology

Digital twin implementation is expected to cost between **A$7M and A$15M**, including enterprise software licenses (**A$2.5M–4M**), cloud analytics and operations dashboards (**A$1.2M–2M**), and physical IoT sensor hardware with integration (**A$2.5M–4.5M**). Additional expenses include 3D modeling and simulation setup (**A$1.5M–2.5M**) as well as training and platform maintenance (**A$1M–2M**) across Olympic zones for real-time monitoring and post-event legacy analysis.

Cloud-Based AI Infrastructure



Cloud infrastructure is expected to cost **A$5M–7M** over the Olympic lifecycle. Key components include elastic compute and machine learning services via AWS, Azure, or Google Cloud (**A$2M–3.5M**), scalable storage for operational data and logs (**A$600K–1.2M**), and cloud-based security and compliance architecture (**A$500K–800K**). Serverless application hosting and real-time dashboards contribute **A$1M–1.5M**, while DevOps, monitoring, and system resilience infrastructure account for **A$600K–900K**.

PER-VENUE COST ESTIMATION FOR TECHNOLOGY ADOPTION

Brisbane's per-venue costs stay between A$100K–400K, supporting modular rollout aligned with its reuse and legacy-first strategy.

1. AI-Powered Simulations

The estimated per-venue cost for AI-powered simulations ranges between A$200K–A$400K. This includes multi-year licenses for platforms like Autodesk Spacemaker (~A$2K/user/year), AnyLogic Advanced (~A$6,200–15,800 per seat), and Bentley OpenBuildings, with typical deployment across 3 tools and 3–6 users each. When combined with setup, training, and scenario testing support, the total cost reflects a full-stack simulation lifecycle tailored to venue-specific layouts, crowd dynamics, and safety scenario modeling.

2. Digital-Twin Technology

The estimated per-venue cost for AI-powered simulations ranges between A$200K–A$400K. This includes multi-year licenses for platforms like Autodesk Spacemaker (~A$2K/user/year), AnyLogic Advanced (~A$6,200–15,800 per seat), and Bentley OpenBuildings, with typical deployment across 3 tools and 3–6 users each. When combined with setup, training, and scenario testing support, the total cost reflects a full-stack simulation lifecycle tailored to venue-specific layouts, crowd dynamics, and safety scenario modeling.

3. Predictive Analytics & Machine Learning

For predictive analytics and ML tools, the estimated per-venue cost lies between A$100K–A$250K. Cloud compute and deployment costs (e.g., AWS SageMaker, Vertex AI) for forecasting models range from A$20K–A$60K. Visualization tools (e.g., Tableau or QuickSight for 10–15 staff) contribute another A$10K–A$25K. Integration pipelines for live ticketing, vendor, or mobility data range from A$30K–A$50K. Finally, localized tuning and AI consultation, either in-house or outsourced, adds an estimated A$40K–A$100K per venue.

4. Smart-City Management Systems

Smart city systems are projected to cost around **A$150K–A$300K per venue**. IoT-based waste, energy, and traffic control integration (e.g., street lighting, utility sensors, emergency beacons) can cost A$60K–A$120K. Software for centralized dashboards, policy rules engines, and sustainability metrics management adds A$40K–A$80K. Mobility coordination (data pipelines from metro, pedestrian flow, bikeshare, etc.) contributes A$30K–A$60K, and setup of citywide interoperability standards, backups, and training make up the rest.

5. Cloud-Based AI Infrastructure

Per-venue costs for cloud-based infrastructure are estimated between **A$250K–A$400K**, depending on scope and usage peaks. Storage and compute provisioning (e.g., SageMaker, Synapse Analytics, Google BigQuery) typically ranges from A$80K–A$150K. Live-stream-ready content delivery, edge compute deployment, and secure API hosting contribute another A$100K–A$150K. Tools such as AWS QuickSight or Azure Monitor for dashboards and real-time analytics contribute ~A$40K–A$60K, while load testing, autoscaling design, and cloud security setup round off the remaining cost.

ENVIRONMENTAL IMPACT AND REDUCED CARBON FOOTPRINT

Brisbane's tech stack can reduce up to 5,000 tons CO_2e, directly supporting its ambition to be the first climate-positive Olympic host

AI-Powered Simulations

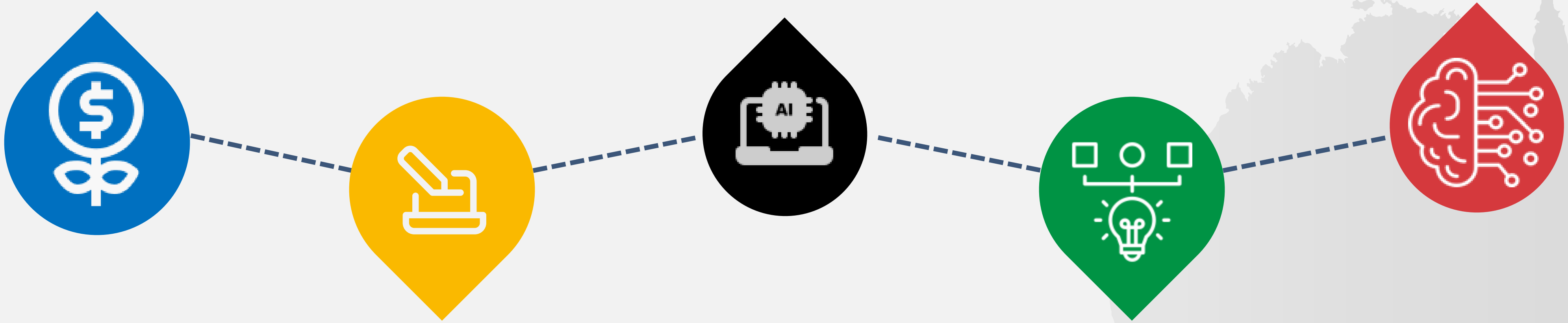
AI-powered simulations are estimated to reduce carbon emissions by approximately 2,000 to 5,000 tons of CO_2e during the planning and construction phases of Olympic venues. By enabling virtual testing of designs and operational scenarios, these simulations help prevent unnecessary construction changes, thereby lowering the use of cement, steel, and fuel during rework phases. For instance, avoiding a single venue redesign can save between 100 to 200 tons of CO_2e. When applied across multiple venues, early interventions facilitated by simulations can lead to substantial cumulative savings. Additionally, optimizing layouts and logistics through simulations contributes to further reductions in material usage and energy consumption.

Predictive Analytics and Machine Learning

Predictive analytics and machine learning tools help optimize operations by reducing unnecessary resource consumption and emissions. Improved crowd distribution models minimize traffic congestion and vehicle idle time, saving approximately 30–70 tons CO_2e. Optimized staff and volunteer scheduling avoids redundant transportation, reducing emissions by another 40–100 tons. Additionally, better demand forecasting curbs overproduction and refrigeration requirements for perishable goods, leading to 50–150 tons CO_2e savings. These combined interventions result in net emissions savings of approximately 150–400 tons CO_2e per venue over the planning and execution lifecycle of the Games.

Cloud-Based AI Infrastructure

Estimated CO_2e Savings: ~200–500 tons CO_2e per venue annually.
Transitioning to cloud-based AI infrastructure reduces reliance on energy-intensive on-premises data centers. Cloud providers often utilize renewable energy sources, leading to lower carbon footprints. For instance, implementing AI systems in buildings has shown to reduce HVAC energy consumption by up to 15.8%, saving significant amounts of CO_2e annually.



Digital-Twin Technology

Annual energy use per Olympic venue = **3–5 GWh**
Digital twins enable **8–15% energy savings** via smarter HVAC, lighting & scheduling.
240,000–750,000 kWh saved/year/venue → ~190–600 tons CO_2e saved per venue annually → A$48,000–150,000 saved/year *(@A$0.20/kWh)*

Implementing digital twin technologies can lead to an estimated **15% reduction in emissions**, translating to significant CO_2e savings per venue. These technologies optimize energy and HVAC usage in real time by simulating and monitoring various operational aspects of the venues. For example, digital twins enable smarter HVAC, lighting, and scheduling, which can result in substantial energy savings and corresponding emission reductions. The adoption of digital twins in events like the Paris 2024 Olympics has showcased their effectiveness in enhancing sustainability.

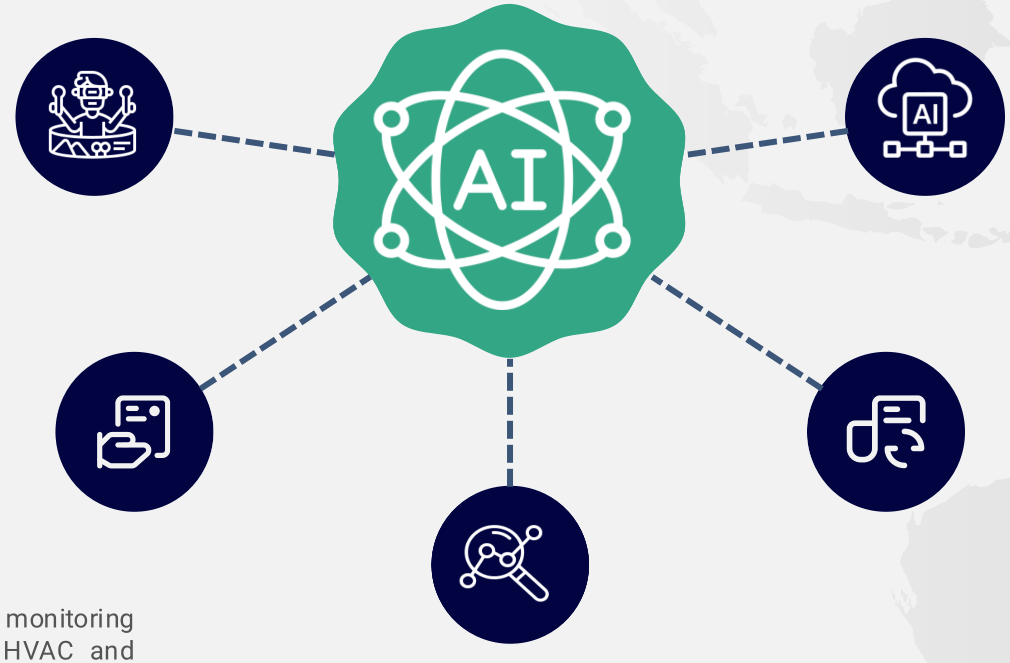
Smart City Management Systems

Estimated CO_2e Savings: ~100–300 tons CO_2 per venue annually.

Smart city systems integrate AI-driven solutions for energy management, optimizing urban infrastructure and services. Real-time data analysis enables efficient energy use, reducing emissions. For example, implementing digital twins and AI in building management has demonstrated energy savings of up to 30%, contributing to substantial CO_2e reductions.

HOW THE PROPOSED TECHNOLOGIES HELP SAVE RESOURCES

Brisbane’s tech adoption minimizes waste, reduces rework, and ensures leaner, smarter Games operations.



AI-Powered Simulations

AI-powered simulations reduce infrastructure costs by identifying design-stage inefficiencies early, eliminating the need for expensive rework. By modelling crowd flow, emergency scenarios, and transport stress points, planners avoid overbuilding stadium sections or oversizing HVAC systems — yielding savings of A$500K–A$1M per large venue. Optimized logistics also cut idle fuel usage and reduce heavy machinery rentals. Over time, these simulations prevent cumulative scheduling delays and streamline regulatory approvals, resulting in faster project lifecycles and reduced consulting overheads.

Digital-Twin Technology

Digital twin prevents overspending by enabling real-time monitoring of venue conditions and energy use. They simulate HVAC and lighting operations to fine-tune efficiency, reducing energy bills by 8–15%, which translates to A$48,000–150,000 saved per venue annually. By right-sizing infrastructure via simulations, cities avoid building excess seating or entryways, cutting down initial construction costs. Legacy simulation also enables long-term savings by ensuring post-Games repurposing is viable and cost-effective.

Predictive Analytics & Machine Learning

Predictive analytics and ML reduce staffing costs by accurately forecasting volunteer and service needs, eliminating labor redundancy. Revenue is optimized through dynamic ticket and merchandise pricing models based on real-time demand signals. Emergency reallocations, which often lead to fines and logistical chaos, are minimized through congestion and resource prediction tools. Forecasting demand for perishable goods like food and medicine also curbs spoilage, leading to supply chain savings up to A$100,000 across major venues.

Cloud-Based AI Infrastructure

Cloud-based infrastructure significantly reduces CapEx by eliminating the need for on-premises servers, software licensing, and data centers. AI workloads such as surveillance feeds, ticketing, and streaming services are scaled dynamically, so Brisbane pays only for what is used. This pay-as-you-go model avoids overspending and allows teams to experiment at low cost. Additionally, cloud-native tools reduce IT staffing needs, cut training overheads, and provide automatic system updates, reducing total maintenance cost by 30–40%.

Smart-City Management Systems

Smart City platforms unify control over transport, waste, and energy systems. Waste pickup schedules are optimized based on real-time fill levels, reducing collection costs by 10–20%. Energy grids dynamically adjust lighting and HVAC based on occupancy, yielding operational savings of ~A$30K–A$75K per venue annually. Centralized dashboards reduce the need for siloed systems, decreasing redundant staffing and maintenance contracts. During the Games, real-time mobility coordination prevents costly delays in athlete and spectator logistics.

ESTIMATED SAVINGS VIA EACH PROPOSED TECHNOLOGY

Brisbane stands to save A$30M–100M per domain by pre-empting delays, overspend, and infrastructure misalignment.

Cloud-Based AI Infrastructure

Expected savings from cloud-based AI systems range from **A$35M to A$70M**. These platforms reduce IT infrastructure costs through elasticity (pay-as-you-go compute), eliminate on-premises hardware maintenance, and enhance scalability during peak events. Integrated surveillance and ticketing reduce manual staff hours and operational bottlenecks. Furthermore, combining compute, analytics, and AI tools in one stack cuts down system integration and downtime costs.

AI-Powered Simulations

Estimated cost savings from AI-powered simulations are projected between **A$50M to A$100M**. These tools reduce project delivery costs by 5–15%, significantly lower change-order expenses (by 50–75%), and minimize delays. For example, avoiding just 1–2% of construction delay on a projected A$1B venue development budget could yield A$10M–20M in savings alone. Simulations also reduce overengineering by optimizing structural and layout decisions early in the design process.

Smart-City Management Systems

Smart city platforms may save **A$40M to A$80M** across the Games through efficient management of utilities, traffic, and emergency services. Real-time waste routing and electricity grid balancing reduce operational costs. Crisis response coordination across agencies minimizes redundancy and idle service overlap. Additionally, predictive demand planning avoids unnecessary expansion of physical systems, saving capital outlays and ongoing service costs.

Digital-Twin Technology

Digital twin platforms are expected to yield savings of approximately **A$40M to A$90M**. Real-time optimization of HVAC and lighting reduces energy costs by 8–15% per venue, while simulation-driven repurposing and conflict detection can avoid costly retrofits or inefficient infrastructure. Preventing overbuilt venues and resolving layout issues early can save A$1M–2M per venue, especially when applied to 15–20 large facilities.

Predictive Analytics & Machine Learning

Predictive analytics and ML models can save an estimated **A$30M to A$60M**. Labor cost reductions from optimized staffing alone (10–25%) account for major savings across venues. Improved dynamic pricing boosts ticket and merchandise revenues by 5–15%, while waste reduction in food and medical inventory (10–20%) adds further operational savings. ML dashboards also streamline decision-making, reducing response costs during high-pressure moments.

MODE OF DEVELOPMENT AND VENDOR OPTIONS

Brisbane's vendor-first approach enables faster deployment while maintaining control through local integration and oversight.

Cloud-Based AI Infrastructure

Fully vendor-managed through AWS, Azure, or Google Cloud contracts. In-house development is infeasible and cost-prohibitive (~A$200M+). Cities manage data controls and compliance, while vendors ensure uptime and scalability. Maintenance is governed by SLAs, with minimal internal load. Used effectively at Tokyo 2020 for real-time venue analytics.

AI-Powered Simulations

Primarily sourced through vendor licensing (e.g., Autodesk, AnyLogic), these tools are not developed in-house or acquired via M&A. While internal teams may fine-tune simulations, building from scratch would incur high opportunity costs (~A$20M). Maintenance includes software renewals, scenario updates, and retraining, averaging A$200K–400K per venue. Paris 2024 followed a similar vendor-driven model.

Smart-City Management Systems

Typically vendor-built (e.g., IBM, Hitachi), smart platforms are customized by cities but not built in-house. M&A is uncommon; building from scratch poses major integration risks. Maintenance is high due to critical operations and sensor uptime. Singapore's Smart Nation strategy reflects this mix of vendor support with local customization.

Digital-Twin Technology

Adopted via enterprise vendors like Siemens and Microsoft, digital twins require heavy vendor infrastructure, with limited internal customization. In-house development is avoided due to high complexity and 2–3 year delays. Maintenance is significant (~A$500K/year), covering sensor calibration, 3D model refreshes, and analytics. Dubai Expo 2020 followed this hybrid approach.

Predictive Analytics & Machine Learning

ML systems use cloud platforms (AWS, Google) combined with internal data teams for model development. Full outsourcing is rare due to the need for localized control. Opportunity cost of not building in-house is high (loss of adaptability). Maintenance (model retraining, data pipelines) is moderate (A$300K–500K across 3 years). Tokyo 2020 used this co-development model.

OPPORTUNITY COSTS ASSOCIATED WITH THE PROPOSED TECHNOLOGIES

For Brisbane, delaying tech adoption risks cost blowouts, stranded assets, and missed climate targets.

AI-Powered Simulations

Opportunity costs for AI simulations stem from the time-intensive model calibration, need for skilled system integrators, and early decision reliance on synthetic data. Misalignment between simulated and real-world behaviour can lead to costly late-stage redesigns if assumptions are inaccurate. Additionally, initial simulation setup may delay early-stage approvals by weeks if not well-planned. These delays may risk sunk costs in parallel design activities that could become invalidated.

Smart City Management Systems

These systems often require public agency alignment and procurement cycles that span months. Delays in city-level approvals or infrastructure ownership ambiguity can cause lost momentum. Another risk is the missed coordination between overlapping systems—e.g., traffic AI vs. emergency routing—which, if not properly integrated, results in fragmented decision-making. Moreover, initial investments in legacy systems may become sunk costs if not migrated strategically.

Digital-Twin Technology

Opportunity costs for digital twins arise when data silos or integration bottlenecks delay real-time insights. Incomplete or inaccurate IoT data ingestion can lead to false optimization outputs (e.g., faulty HVAC efficiency models), causing misinformed operational decisions. Furthermore, heavy reliance on vendor-managed platforms can reduce internal agility and adaptability. There is also the risk of underutilizing the platform if staff are not sufficiently trained to leverage simulation dashboards effectively.

Cloud-Based AI Infrastructure

Cloud-first infrastructure demands upfront architectural redesigns. Opportunity costs emerge if platforms are misconfigured (e.g., underestimating concurrent usage or data spike thresholds), leading to performance bottlenecks. There's also the risk of vendor lock-in — migrating workloads across clouds later can become prohibitively expensive. Delayed provisioning of identity and access protocols may also stall AI module deployment across Olympic venues.

Predictive Analytics & Machine Learning

The main opportunity cost comes from overfitting predictive models to historical patterns that may not hold true during live events (e.g., weather shifts, last-minute political or health restrictions). If staff rely too heavily on model suggestions, there is reduced space for human intervention during real-time deviations. Additionally, not aligning models with external systems (ticketing, logistics) risks duplicative forecasting pipelines that drain data science resources.

TECHNOLOGICALLY RELEVANT FINAL RECOMMENDATIONS | BRISBANE 2032

Brisbane 2032's technology strategy brings together AI, cloud, digital twins, and governance to deliver a Games that's intelligent in real time and intentional for the future.

1

Centralized Smart Infrastructure Operations Hub

Establish a real-time, AI-enabled command center integrating all Olympic systems — including venue sensors, transport feeds, digital twin outputs, cloud dashboards, and security data.

Enables unified decision-making and cross-agency coordination.

Reduces system fragmentation and latency across decentralized Olympic zones.

Inspired by Qatar 2022's centralized digital command approach.

2

Localized AI Simulation Calibration

Ensure crowd, transport, and emergency simulations are trained using Brisbane-specific data (climate, mobility behavior, event culture).

Avoids overfitting to irrelevant global datasets.

Enhances scenario reliability under stress conditions (e.g., heatwaves, regional surges).

Supports infrastructure planning and venue layout refinement.

3

Scalable, Redundant Cloud Infrastructure with Edge Support

Design a hybrid cloud system with edge nodes deployed at key venues.

Supports real-time applications like surveillance, biometric access, athlete monitoring, and live analytics.

Ensures uptime during peak traffic and remote site operations (e.g., Gold Coast, Logan).

Integrates auto-scaling, failover, and local caching for seamless service delivery.

4

Digital Twin-Driven Infrastructure Planning

Mandate that all major venue and infrastructure developments be modeled using digital twins.

Enables scenario testing for pre-Games operations and post-Games reuse.

Tracks carbon, energy, and lifecycle performance metrics.

Supports adaptive reconfiguration (e.g., temporary stadium → housing).

5

Secure, Auditable AI and Data Governance Framework

Deploy robust identity access management, encryption protocols, and audit trails across all AI-powered systems.

Ensures compliance with GDPR, Australian Privacy Act, and cross-border athlete data rules.

Introduce explainability protocols for real-time AI systems (e.g., crowd behavior alerts, access controls).

Mitigates risks from facial recognition, health monitoring, and predictive surveillance platforms.

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