Counting Crowds – Calculating event attendance

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“How many people attended the event?”
2011...10,000 people attended!
2012...15,000 people attended!
2013...20,000 people attended!
2014...25,000 people attended!
2019?
2017, right, the image of President Trump’s inauguration. (National Park Service)

Source: Washington Post, online; 7 March 17
2009, left, at President Obama’s first inauguration on the Mall in Washington. 2017, right, the image of President Trump’s inauguration. (National Park Service)

Source: Washington Post, online; 7 March 17
The Backstory

• Back to school
• 2015, Master of Tourism Management
• Thesis = Research project
• Answer the age-old question...

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“How many people attended the event?”
Today’s Workshop Outcomes

1. Exploration of different types of crowds.

2. Review practical methods for attendance calculation.

3. Review best practices for overcoming calculation challenges > Triangulation
Definitions

Total Attendance
• All the people at the event over a period of time.

Attendance Calculation
• a.k.a Crowd counting
• a.k.a. People counting
Definitions

Open-access, un-ticketed events

- Absence of a physical perimeter (walls, fences, doors)
- Availability of multiple access and egress points
- Absence of a systematic calculation framework
(Academic) Research says...

- Attendance = success
- Reliable data is important
- Calculating attendance is hard
- Exaggerated or overstated numbers are a well-documented occurrence; understated numbers.
My Findings

• Strong motivation to ‘get it wrong’
  • 2 types of figures
    • Impression bias vs. Operational bias

• Consequence > Absence of accepted methodology for calculating attendance; no one-way approach

• Need > Standardized calculation framework
Path...

Types of crowds

Existing crowd calculation methods

‘Science’ (math)
Disclaimer: Accurate vs. Defendable

‘Accurate’
Correct in all details; exact.

‘Defendable’
Capable of being defended with good reasoning.

Source: www.dictionary.com
## Selection of attendance calculation methods

<table>
<thead>
<tr>
<th>CALCULATION METHOD</th>
<th># of mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head counts/clicker counting</td>
<td>7</td>
</tr>
<tr>
<td>Counts provided by police/private security</td>
<td>4</td>
</tr>
<tr>
<td>Visitor interactions with staff/programming features</td>
<td>3</td>
</tr>
<tr>
<td># of onsite surveys completed</td>
<td>2</td>
</tr>
<tr>
<td>Manual gated entrance counts</td>
<td>2</td>
</tr>
<tr>
<td>Maximum capacity calculation</td>
<td>2</td>
</tr>
<tr>
<td>Product sampling/material give-aways</td>
<td>2</td>
</tr>
<tr>
<td>Registration</td>
<td>2</td>
</tr>
<tr>
<td>Wristbands</td>
<td>2</td>
</tr>
<tr>
<td>Cordon line counts</td>
<td>1</td>
</tr>
<tr>
<td>Estimations based on attendance at the same event in previous years</td>
<td>1</td>
</tr>
<tr>
<td>Evaluation of onsite sales data (vendor sales, ATM withdraws)</td>
<td>1</td>
</tr>
<tr>
<td>Kid/parent ratio estimation</td>
<td>1</td>
</tr>
<tr>
<td>Mechanical/technology-based counters/sensors</td>
<td>1</td>
</tr>
<tr>
<td>Parking lot counts/car counts</td>
<td>1</td>
</tr>
<tr>
<td>Scale-size space ratios</td>
<td>1</td>
</tr>
<tr>
<td>Septic pump/waste calculation</td>
<td>1</td>
</tr>
<tr>
<td>Shuttle bus rider counts</td>
<td>1</td>
</tr>
<tr>
<td>Telephone surveys/core sampling</td>
<td>1</td>
</tr>
<tr>
<td>Website/social media traffic analysis</td>
<td>1</td>
</tr>
</tbody>
</table>
2 Types of Crowds

**Semi-static crowds**
(i.e. parades, protests)

**Transient crowds**
(consistent turnover)

**Defining element > Crowd turnover**

Crowd Turnover > Participants who leave an event early and are replaced with new participants later.

Biaett (p.7, n.d.)
Semi-static Crowds  (Limited crowd turnover)

Calculation Methods & Tools

1. Maximum capacity (method)
2. Grid method (method)
3. Aerial photography/videography (tool)
Semi-static Crowds – Calculation

Method #1: Maximum Capacity

- Simple mathematical calculation
- Square area: length multiplied by width
- Adjustments: trees, bushes, places people can’t occupy
- Prevents over exaggeration

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Semi-static Crowds – Calculation

Method #2: Grid method

- Widely-accepted methods for static crowds
- 3 factors
  - Square footage of the site
  - Percentage of the site occupied
  - Crowd density
    - Loose – 1 person/square metre (10 ft.)
    - Solid – 2 people/square metre (5 ft.)
    - Very dense – 4 people/per square metre (2.5 ft.)
Method #3: Aerial photography/videography

- Roof tops, Google Earth, media images
- Increases number of perspectives available
- Time-consuming and resource-dependent
- Areas obscured by view
Semi-static Crowds

Pros/Cons of Semi-static methods

Benefits

• Determining density at peak periods
• Density-at-interval comparisons
• Year-over-year analysis

Challenges

• “Snapshot” only view
• Doesn’t account for flow, repeat visitors
Transient Crowds  (Consistent crowd turnover)

Calculation Methods & Tools

1. Count and Follow-up, “Cordon line”
2. Tag and Recapture
3. Gate counting
4. Surveys, questionnaires, interviews
5. Technology

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Transient Crowds – Calculation

Method #1: Count and Follow-up, “Cordon line”

- Attendee movements along determined route
- Cordon line = counting point
- Benefit = identify turnover; express as %
- Challenges:
  - Reverse flow of traffic
  - Entrance/exit before Cordon Line

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Method #2: Tag and Recapture

- Attempt to overcome double-counting
- Develop a ratio > Counted : Uncounted
  - 100 tagged, 10% of tagged are counted
  - 10% = 10% of total attendees (1,000)
Method #3: Gate counting

- Clickers at access and egress points
- 2 approaches:
  - Continuous counts = attendance
  - Counts over short intervals = flow
- Challenges: multiple access points, double-counting
Method #4: Surveys, questionnaires, interviews

- Validation method rather calculation
- Use with grid / gate counting to account for turnover
- Questions:
  - Length of stay = turnover ratio
  - # of people in group
  - Multiple event sites
Method #5: Technology

- Emerging technology*
- RFID – Radio-frequency identification
  - Microchip wristbands (tap = gate count)
- Bluetooth scanning
  - Scanners roam for enabled Bluetooth devices
Pros/Cons of Transient methods

Benefits

• Account for flow
• Surveys = turnover
• Year-over-year analysis

Challenges

• Significant resource requirements
Hypothesis!

The **use of multiple calculation methods** may be necessary to account for crowd density, turnover, attendee flow and repeat visitation.
Science

- Triangulation -

The use of multiple data sources to validate data.

Eliminates guess work and exaggeration.

“A sensible approach to verifying the reliability of attendance estimates.”
\[
\frac{M1 + M2 + M3}{3} = \text{Attendance #}
\]

M = Calculation method

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Real World Application!

1. Understand your crowd
   • Semi-static and/or transient

2. Utilize 3 different calculation methods that:
   • Account for crowd dynamics
   • Generate large aggregate numbers
   • Establish set calculation time intervals

3. Triangulate to achieve an average number

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Festival

Crowd dynamic: Transient

Factors...

Turnover; multiple entrances; flow
SURVEYS

Parade
Crowd dynamic: Semi-static
Factors...
Multiple entrances, clustering

MAX. CAPACITY
GRID
AERIAL PHOTOS

Sporting Event

Crowd dynamic: Transient & Semi-static

Factors...
# entrances, clustering, roaming

GIVE AWAYS

SURVEYS
Tips for choosing calculation methods

- Account for underestimated numbers
- Account for overestimated numbers
- Dedicate time/interval for counting
- Defend the significance of the methods
- Use gate counts whenever possible
- Train staff/volunteers on how to use the methods
Leadership in practice

• Commit to counting attendance
• Avoid calculation biases
• Commit to sharing defendable numbers
• Defend your methods to stakeholders
• Share your calculation practices
Innovation starts to travel...

Lessons start to travel...

Standardized methods & Standardized data
Thank you!

Questions?