Data-driven urban planning & design

ULI Leadership Convivium
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Space Syntax
Drivers of change

- Large scale automation
- Climate change
- Energy demand
- Austerity
- Inequality
- Ageing population
- Growing population
Impacts and issues

- Large scale automation
- Employment + Skills
- Austerity
- Inequality
- Provision of services
- Ageing population
- Climate change
- Air quality
- Housing demand, supply + affordability
- Growing population
- Energy demand
Opportunities for change

- Large scale automation
- Employment + Skills
- Austerity
- Universal Basic Income
- New models of welfare
- Provision of services
- Inequality
- Provision of services
- Ageing population
- Climate change
- Air quality
- Growing population
- Energy demand
- New models of mobility
- New models of ownership
- New models of planning One City Plan
- New models of finance
Enabling technologies

- Large scale automation
- Employment + Skills
- Platforms
- Tokens
- Time banking
- Austerity
- Universal Basic Income
- New models of welfare
- Inequality
- Provision of services
- Ageing population
- Climate change
- Air quality + Climate change
- Off-site construction + new manufacturing
- Housing demand, supply + affordability
- Growing population
- Clean + renewable energy production
- Energy demand
- New models of mobility
- New models of ownership
- New models of planning
- New models of finance
- Electric Vehicles
- Automated Vehicles
- Digital twins
A growing trend towards cities

Source: UN-Habitat, Goldmann Sachs
Urban challenge #1  Fast highways have replaced main streets

Fast highways, separating global & local movement.
Suppressed movement economy.

Main street, mixing global & local movement.
Enhanced movement economy.
The **fragmented** "city" of disconnected developments.

The **integrated** city of continuously connected neighbourhoods.
1. Presence
2. Copresence
3. Communication
4. Interaction
5. Transaction
6. Introduction
7. Innovation
8. Broadcast
Spatial Accessibility  A fundamental property of street networks
Key discovery #1  Spatial Accessibility predicts movement

Pedestrian movement

\[ y = 0.784x + 2.147, \text{ R-squared: } 0.589 \]

Vehicle movement

\[ y = 1.235x + 1.048, \text{ R-squared: } 0.702 \]
Spatial masterplanning  Designing the geometry of the grid
Spatial masterplanning  Designing the geometry of the grid
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Spatial masterplanning  Designing the geometry of the grid
Key discovery #2  Spatial Accessibility influences land use viability

80% retail located on 20% most spatially accessible streets
Key discovery #3  Spatial Accessibility influences crime & safety
Key discovery #4  Spatial Accessibility influences land value

<table>
<thead>
<tr>
<th></th>
<th>Disconnected layout</th>
<th>Connected layout</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRR</td>
<td>15%</td>
<td>18%</td>
<td>3%</td>
</tr>
<tr>
<td>NPV</td>
<td>RMB 6.65 Billion</td>
<td>RMB 10.0 Billion</td>
<td>RMB3.35 Billion</td>
</tr>
</tbody>
</table>
Key discovery #5  Spatial layout influences congestion

Local scale integration
Active centres

Travel to work
Drive car or van

Oxford
Key discovery #6  Spatial layout influences health

Local scale integration
Active centres

Health
Very good health

Oxford
Integrated Urban Modelling

Applications

Engagement/community-lead planning
Mobility Regulation/Subsidy
Service Prioritisation

Drivers | Impacts
Opportunities | Technologies

Urban Data Platform
Rapid urban growth

Existing 长春

Proposed 规划深入

Spatial accessibility
- high
- low
Darwin CBD Masterplan, Australia
Land Value Model predicts > $AUD 3.7 billion total land value
Land Use Attraction  Retail and Catering  MultiScale (10k & 1.2k)

Ground floor land use
- Retail
- Catering

Primary Routes
- Super MultiScale (v.global and v.local)
- MultiScale (global and local)
- Global (vehicle oriented)
- Local (pedestrian oriented)
Enhancing asset performance  Retail circulation

Existing

Proposed
Case Study

St David's Centre

Cardiff, UK

Project type
Major extension of existing, city centre retail development

Space Syntax Services
Visitor footfall prediction

Project status
Construction complete:
129,562 sq.m

40 million visitors per annum
Existing visitor flow

28 million people per year

Pedestrian movement (people per hour)

- 2500 - +
- 1500 - 2500
- 1000 - 1500
- 500 - 1000
- 250 - 500
- 0 - 250
Footfall forecast model  Step 1
Footfall forecast model  Step 2

38 million
people per year

Forecast pedestrian movement
All day average (people per hour)

- 3,500 - 4,000
- 3,000 - 3,500
- 2,500 - 3,000
- 2,000 - 2,500
- 1,500 - 2,000
- 1,000 - 1,500
- 0 - 1,000
## Case Study

### Trinity Centre

**Leeds, UK**

<table>
<thead>
<tr>
<th>Project type</th>
<th>Space Syntax Services</th>
<th>Project status</th>
</tr>
</thead>
<tbody>
<tr>
<td>New, major city-centre retail development</td>
<td>Circulation Design Review</td>
<td>Construction complete</td>
</tr>
<tr>
<td></td>
<td>Circulation Design Scenario</td>
<td>92,903 sq.m</td>
</tr>
<tr>
<td></td>
<td>Modelling (Strategic modelling)</td>
<td>23 million visitors per annum</td>
</tr>
</tbody>
</table>

**Construction complete**

- **92,903 sq.m**
- **23 million visitors per annum**
Footfall modelling
<table>
<thead>
<tr>
<th>People and Organisations</th>
<th>Places and Buildings</th>
<th>Property Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communities</td>
<td>Metro Area and City</td>
<td>Plan</td>
</tr>
<tr>
<td>Public Authorities, Utilities</td>
<td>Districts</td>
<td>Invest and Fund</td>
</tr>
<tr>
<td>Property Investors and Developers</td>
<td>Neighbourhoods and Places</td>
<td>Design</td>
</tr>
<tr>
<td>Property Funders</td>
<td>Buildings</td>
<td>Build</td>
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<tr>
<td>Property Consultants</td>
<td>Units</td>
<td>Operate</td>
</tr>
<tr>
<td>Construction Firms</td>
<td>Rooms</td>
<td>Refurbish</td>
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</tbody>
</table>
Digital Organising Models

- Economic and Social Models
- Digital Master Planning Models
- Investment Models
- Adoption Models

Digital Business Models

- eCommerce and eService
- Trading Platform, Dynamic Supply Chain
- Crowdsourcing and Crowdfunding
- Social Networks and the Sharing Economy
Digital Urban Platform

Linked data visualisation platform
Emu Analytics’ Location Insights Explorer

Space Syntax IUM
Transport

Mobile operator Origin-Destination matrix and mode share at LSOA level

Third party apps eg Strava

Physical activity

SweatCoin average steps per day per user per LSOA

Health Dataset

Health & wellbeing

NHS open data eg Dr:patient ratios, patient satisfaction scores

Local employment and workforce datasets

Socio-economic

OSM Census

Community builders area scores

Linked data visualisation platform
Emu Analytics’ Location Insights Explorer
Conclusion

The adoption of digital technologies will change the face of cities as surely as any previous technology, whether the railway, the car or the skyscraper.