Nico Larco, AIA
Associate Professor, Dept. of Architecture
Co-Founder and Co-Director, Sustainable Cities Initiative
University of Oregon
nlarco@uoregon.edu
Why Are We Here?
Urbanism Next
Parameters / Inputs

– Role of Transit (and Ridesourcing)
Parameters / Inputs
- Role of Transit (and Ridesourcing)
- Fleets vs. Individual Ownership
Parameters / Inputs

- Role of Transit (and Ridesourcing)
- Fleets vs. Individual Ownership
- Cost of AV’s
E-COMMERCE: BRICK-AND-MORTAR SLIDE CONTINUES – 12% DROP IN STORE TRIPS THIS PAST HOLIDAY

A recent article in the Wall Street Journal documents the continued rise of e-commerce coupled with the inevitable slide of brick-and-mortar stores. A few key numbers:

- Overall, online holiday sales increased by 11% over the previous year while brick-and-mortar sales increased only 2.7%
- JC Penny brick-and-mortar sales dropped by nearly 1% while its online sales grew by double digits.
- Amazon was the clear leader in online sales with 38% of all online revenue.

Parameters / Inputs

- Role of Transit (and Ridesourcing)
- Fleets vs. Individual Ownership
- Cost of AV’s
- E-Commerce Dominance (?)
Parameters / Inputs

- Role of Transit (and Ridesourcing)
- Fleets vs. Individual Ownership
- Cost of AV’s
- E-Commerce Dominance (?)
- General Desire for Proximity / Open Space
5 Design / Development Effects

- Land Use
- Space / Physical Design
- Density / Proximity
- Dispersion / Sprawl
- Vitality / Activity
Land Use

- Parking Re-Use / Elimination
- Fleet Storage
- Bricks and Mortar Retail Dev. Reduction / Consolidation
- E-Commerce Warehouse/Distribution
- Where Do We Live?
Space / Physical Design

- Parking Related
  - Lots/Structures Re-Used, No Longer Gaps
  - Increase in Bldg Density/Height (Reduced Parking Req.)
  - Increase in Density as Lots Filled (Urban / Suburban)
Space / Physical Design

- Street Design
  - Reduction/Elimination of On-Street Parking
  - Drop-Off Zones
  - Reduced or Increased Lanes? (Width and Number)
  - Separation of Modes? Increased AV Speeds?
Density / Proximity

- Increase?
  - Urban Centers (continuation of trend)
  - Suburban Centers (no more parking…)
  - End of TOD’s? But, Density = Access to UBER?
Dispersion / Sprawl

- Reduced ‘Friction’ of Travel Cost
- Appetite for Further Commute
- What Will Limit Urban Dispersion?
Vitality / Activity

- Possible Reduction:
  - Who’s on Street
  - Shopping Districts Diminishing

- Possible Increase:
  - Walkable Suburban Centers?
  - Incr. Accessibility to Centers (Urb/Suburb)
5 Design / Development Effects

- Land Use
- Space / Physical Design
- Density / Proximity
- Dispersion / Sprawl
- Vitality / Activity
If design is one framework for choice…
Then how does travel behavior respond?
There will be fewer collisions

Otherwise there is speculation about how our robot overlords will cause...

**Optimistic**

- Less vehicle ownership
- Expensive AVs / More Shared
- Less commoditization
- Less VMT
- More Accessible Regions
- Reduced infrastructure
- Reduced parking
- More time for leisure
- More time for human connectivity

**Pessimistic**

- More vehicle ownership
- Cheap AVs / Less Shared
- Car = ultimate commodity
- More VMT
- More Sprawl
- Similar infrastructure
- Similar parking
- More time for work
- More social disconnection via digital devices etc.
Behavioral response to the built environment

The ROW that we (supposedly) control
Design & Behavioral Response
Behavioral dimension: how the street makes you think about your mode choice?
DESIGN STREETS TO DISSAPEAR?
MORE STREETS LIKE THIS?
WHERE THE LANDSCAPE DISOLVES INTO THE STREET?
OR MORE LIKE THIS? DESIGN RELATES TO BEHAVIORAL ECONOMICS
HUMAN PERCEPTIONS CHANGE BASED ON EXPERIENCE & USER TYPE

On Bike Video

Car Dash Video
Moving Camera Survey Method

Source: NCHRP Report 616
Importance of Perception

• Consistent with other work, **well-marked lane separation preferred** but varies based on cyclist experience (women and children prefer)
• Perceived **comfort is connected w/ skill level**
• **Availability bias / prospect theory**: neither drivers or cyclists are good judges of distance or speed while engaging in that mode.
• Implications for cyclist / pedestrian safety and design in autonomous future – **more bicycle & pedestrian streets are more likely to be perceived as safe and biked or walked on by the most needed populations**
Catalyze a conversation on bike / ped rights

At the same time

Uber admits its self-driving cars have a problem with bike lanes

Driverless cars pose threat to growth of cycling in cities
From pedestrian safety to limited road space, how will driverless cars fit in the future of transportation
The Bicyclists’ Manifesto for an Autonomous Vehicle Future

Michael R. Boswell, Ph.D., AICP
William Riggs, Ph.D., AICP
City & Regional Planning
California Polytechnic State University
San Luis Obispo, CA

"Policy goals" won't be enough to protect bicyclists once the cars start driving themselves. Strong standards will be necessary to govern the interactions between cars and bikes in an autonomous future.

September 13, 2016, 5am PDT | William Riggs, Michael R. Boswell
Lyft / Uber Focus on Last 50 Feet

Should planners be focused on the last 5 blocks? Plan the ROW more effectively?
Is a bike lane occupying TNC pickup zone consistent with a multimodal transportation manifesto?
Takeaways

• As innovation continues important to think beyond the vehicle.

• Human behavior is unpredictable (plan for corner cases / redundancy; rethink economic motivators of travel; social norms)

• Built environment policy must co-evolve with mobility innovations

• Develop policies that shape place; let tech adapt – be the cities we want to be.

• Policy must move faster (policy makers embrace agile design)
The Future of Parking in a Changing Mobility Ecology

Presented by: Josh Karlin-Resnick

July 2017
THE FUTURE OF PARKING IN A CHANGING TRANSPORTATION SYSTEM

AGENDA

1. AV Adoption Models and Implications
2. Tipping the Scales Toward a Shared Future
3. Designing for Change
   - Manage Demand & Reduce Supplies
   - Adaptable Structures
   - Designing for Deconstruction
WHERE WOULD YOU VACATION?

OPTION A

OPTION B
POTENTIAL ADOPTION MODELS

“MOBILITY AS A SERVICE” MODEL

TRADITIONAL CAR OWNERSHIP MODEL

Nelson\Nygaard Consulting Associates, Inc.
POTENTIAL ADOPTION MODELS

“MOBILITY AS A SERVICE” MODEL

- Spotify
- Apple Music
- Zipcar

TRADITIONAL CAR OWNERSHIP MODEL

- Tower Records
- Going Out of Business
- Michigan Radio

Right Image Source: Michigan Radio
MOBILITY AS A SERVICE: IMPORTANCE OF THE CURB
TRADITIONAL MODEL: IMPORTANCE OF THE PARKING LOT
ADOPTION MODELS: THE IMPLICATIONS

space required to transport 60 people

car

bus

bicycle

Image Source: Muenster Planning Department
space required to transport 60 people

car

uber

autonomous car

Image Source: Jon Orcutt
ADOPTION MODEL: THE IMPLICATIONS

MOBILITY AS A SERVICE

TRADITIONAL OWNERSHIP
HOW CAN WE HELP ENSURE THAT AVS ARE ADOPTED IN THE WAY THAT IS SYMBIOTIC WITH THE VIBRANT URBAN SPACES WE CHERISH?
TIPPING THE SCALE: PARKING REGS AND INCENTIVES THEY CREATE

PARKING REQUIREMENTS

- Often lead to almost as much space for cars as humans
- Force everyone to take this “amenity”
- Assume one default travel choice, and lock that in for the life of the building
TIPPING THE SCALE: PARKING REGS AND INCENTIVES THEY CREATE

MILPITAS, CA

Parking Minimum: 1 per 240-300 SF

DOWNTOWN PORTLAND

Parking Maximum: 1 per 400 SF

Left Image Source: Google Earth
DESIGNING FOR CHANGE

HOW DO YOU BUILD 20-50-100 YEAR BUILDINGS IN THE FACE OF SUCH UNCERTAINTY IN DEMAND AND TECHNOLOGY ADOPTION?
## CONSIDERING ACCESS NEEDS

The Costs of Providing Parking

<table>
<thead>
<tr>
<th>Recent Cost Estimate</th>
<th>Full Capital Cost</th>
<th>Monthly Amortized Cost with Debt Service (a)</th>
<th>Monthly O&amp;M Cost (b)</th>
<th>Total Monthly Cost (a+b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Above Ground</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santa Cruz</td>
<td>$50,000</td>
<td>$275</td>
<td>$50</td>
<td>$325</td>
</tr>
<tr>
<td>San Francisco</td>
<td>$60,000</td>
<td>$325</td>
<td>$50</td>
<td>$375</td>
</tr>
<tr>
<td><strong>Underground</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Francisco</td>
<td>$100,000</td>
<td>$550</td>
<td>$75</td>
<td>$625</td>
</tr>
</tbody>
</table>

 Anything You Can Do To Provide Access For Less Than This Is A Bargain

Nelson\Nygaard Consulting Associates, Inc.
DESIGN CONSIDERATIONS FOR ADAPTABLE STRUCTURES

- Floor heights
- Potential for fenestration
- Floor plates
  - Load-bearing potential
  - Flat and/or ability to remove ramps
  - Dimensions – workable for office or residential?
- Important caveat: Significant upfront cost to provide this flexibility – as much as $25k-$45k per space
DESIGNING FOR CHANGE: ADAPTABLE STRUCTURES

PLANNED AVALON BAY COMMUNITY (LOS ANGELES)

Source: Nelson\Nygaard Consulting Associates, Inc.

Source: Gensler via LA Times
DESIGN FOR CHANGE: DESIGN FOR DECONSTRUCTION

DESIGN CONSIDERATIONS FOR STRUCTURES THAT CAN BE DECONSTRUCTED

- District Parking: Separate Parking from Active Uses
- Materials:
  - Easy to take apart?
  - Easy to reuse?
DESIGNING FOR CHANGE: DESIGN FOR DECONSTRUCTION

PARKING AS LAND BANK
parking structure as land bank using demountable, recyclable structure

- **2017**: Demountable Parking Garage
  - 4 - 10 Levels

- **2022**: Remove/ Demount as Parking Demand Reduces

- **2027**: Remove/ Demount as Parking Demand Reduces

- **2032**: Parking Structure Replaced with Higher Value Commercial or Residential Development
  - Stackable Parking for Autonomous Vehicles
    - "Pez Dispenser"
POTENTIAL ADOPTION MODELS

“MOBILITY AS A SERVICE” MODEL

TRADITIONAL CAR OWNERSHIP MODEL

- lyft
- Daimler
- Google
- Ford
- Tesla
- Mercedes
- Audi
- GM
- Apple
- LINK & CO
### POTENTIAL EFFECTS ON PARKING & THE BUILT ENVIRONMENT

<table>
<thead>
<tr>
<th>&quot;MOBILITY AS A SERVICE&quot; MODEL</th>
<th>TRADITIONAL CAR OWNERSHIP MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massive decrease in parking demand</td>
<td>Less dramatic decrease in parking demand, but</td>
</tr>
<tr>
<td>Curbside loading is critical</td>
<td>Relocation of parking demand?</td>
</tr>
<tr>
<td>Much more efficient use of vehicle fleet</td>
<td>Modification of vehicle storage</td>
</tr>
</tbody>
</table>

Nelson\Nygaard Consulting Associates, Inc.
WHERE WOULD YOU VACATION?

OPTION A

OPTION B

ILLEGAL

ENCOURAGED
BUILT ENVIRONMENT: POTENTIAL TO REDUCE PARKING

HOW MUCH LESS PARKING MIGHT WE NEED?

- Modeling efforts
  - Zhang et al: ~90% reduction with 50% shared fleet
  - OECD: 80% reduction with 100% shared fleet
  - UT Professor (validated by UC Berkeley Prof. Susan Shaheen): One AV could replace 12 private vehicles
  - McKinsey: 5.7 billion square meters worth of parking (unsubstantiated)

Table 10. Maximum number of parked vehicles for different TaxiBot and AutoVot scenarios (for 24-hour weekday)

<table>
<thead>
<tr>
<th></th>
<th>Max. Parking requirements</th>
<th>% of baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>160,000</td>
<td></td>
</tr>
<tr>
<td>Ride sharing (TaxiBot)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No high-capacity public transport</td>
<td>11,363</td>
<td>7.2</td>
</tr>
<tr>
<td>With high-capacity public transport</td>
<td>8,961</td>
<td>5.6</td>
</tr>
<tr>
<td>Car sharing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No high-capacity public transport</td>
<td>25,321</td>
<td>16.0</td>
</tr>
<tr>
<td>With high-capacity public transport</td>
<td>17,110</td>
<td>10.7</td>
</tr>
<tr>
<td>Ride sharing (AutoVot)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No high-capacity public transport</td>
<td>5,920 + 133,122*</td>
<td>99.4</td>
</tr>
<tr>
<td>With high-capacity public transport</td>
<td>4,822 + 116,689*</td>
<td>75.8</td>
</tr>
<tr>
<td>Car sharing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No high-capacity public transport</td>
<td>12,705 + 133,330*</td>
<td>103.0</td>
</tr>
<tr>
<td>With high-capacity public transport</td>
<td>9,561 + 116,467*</td>
<td>78.8</td>
</tr>
</tbody>
</table>

* = shared + private care

Source: OECD, Urban Mobility System Upgrade
BUILT ENVIRONMENT: POTENTIAL TO DENSIFY PARKING

Source: Audi via Mashable (http://mashable.com/2015/11/17/audi-parking-boston/#6jcaMm8aukqi)
WHAT MIGHT TIP THE SCALE?

COST PER RIDE

- Cost per ride: $1 threshold vs. traditional autos
- Cost of AVs: **Too costly** for vast majority of people?

“Normally, when you sell a car to a customer, you might never see them again... [If AVs are adopted as part of shared fleets,] you could make sure that you really understand where they’re being driven, that they’re operating in appropriate weather for their state-of-art sensors, that the vehicle’s coming back every day, and that they’re being properly maintained and serviced.”

-Jim McBride, Technical Leader of AV Development, Ford
TIPPING THE SCALE: PARKING REGS AND INCENTIVES THEY

If you build it, they will drive.

Even if you don’t build it, they will still come – by other modes!

TIPPING THE SCALE: PARKING REGS AND INCENTIVES THEY CREATE

PARKING REGULATIONS: GROWING MOMENTUM FOR LOWER SUPPLIES?

To Date:
Less Parking =
Concern about Market Expectations
Concern about Access + Spillover

Gaining Steam:
Less Parking =
Affordable Housing, Livable Communities

Nelson\Nygaard Consulting Associates, Inc. 30
TIPPING THE SCALE: PARKING REGS AND INCENTIVES THEY CREATE

MILPITAS, CA
Parking Minimum: 1 per 240-300 SF

MOUNTAIN VIEW, CA (NORTH BAYSHORE)
New Maximum: 1 per ~370 SF

Changes ahead?

Image Sources: Google Earth

Nelson\Nygaard Consulting Associates, Inc.
TIPPING THE SCALE: PARKING REGS AND INCENTIVES THEY CREATE

DOWNTOWN SF

Parking *Maximum*: 7.5% of Floor Area

DOWNTOWN PORTLAND

Parking *Maximum*: 1 per 400 SF

Sources: Flickr Users Scott Beale and TMimagesPDX
MOBILITY AS A SERVICE

- Predictions of rapid growth in this sector by 2021
- Many pilots worldwide
POTENTIAL ADOPTION MODELS: MOBILITY AS A SERVICE
POTENTIAL ADOPTION MODELS: PRIVATE VEHICLES

POTENTIAL FOR ADOPTION AS PRIVATE VEHICLES

- Tesla: Private ownership, but with ability to share through Tesla platform
- Ford: Shared fleets first, available for private purchase later
DESIGNING FOR CHANGE

- Parking + : mixed-program with traditional parking stall requirements
- Automated Parking
- Automated Vehicles
- Reduction in spatial demand over time (both from less overall demand and less space required to move, park, etc)
- Special requirements for EV
RAYETTE LOFTS
(ST. PAUL, MN)

Source: rayette lofts.com
DESIGNING FOR CHANGE: ADAPTABLE STRUCTURES

BOSTON CONVENTION CENTER

Nelson\Nygaard Consulting Associates, Inc. 38 Source: UTILE via ULI
DESIGNING FOR CHANGE: ADAPTABLE STRUCTURES

BOSTON CONVENTION CENTER

Source: UTILE via ULI
DESIGNING FOR CHANGE: ADAPTABLE STRUCTURES

BOSTON CONVENTION CENTER

Source: UTILE via ULI
DESIGNING FOR CHANGE: ADAPTABLE STRUCTURES

4th & COLUMBIA TOWER (SEATTLE)

Ideas about Parking Facility Design (PW)

DESIGNING FOR CHANGE: ADAPTABLE STRUCTURES

4th & COLUMBIA TOWER (SEATTLE)

DESIGNING FOR CHANGE: DESIGN FOR DECONSTRUCTION

FRESNO HSR PLAN
Case Study
DESIGNING FOR CHANGE: DESIGN FOR DECONSTRUCTION

FRESNO HSR PLAN
Parking as strategy for land banking

2017

2032

HSR STATION
PARKINGUSES NEAR TRANSIT

Nelson\Nygaard Consulting Associates, Inc.

PERKINS+WILL
DESIGNING FOR CHANGE: MANAGE DEMAND & REDUCE

PARKING, TDM, AND REDUCED WASTE – TODAY AND IN THE FUTURE

Comparison Report

- $93,368,100 Construction Cost of Unused Spaces
- 26% Average % of Unused Spaces
- 501,300 Square Feet of Unused Parking

6,407 Total Spaces
4,736 Used
1,671 Unused
Avg. Available Spaces / Unit: 1.32
Avg. Occupied Spaces / Unit: 0.98
DESIGNING FOR CHANGE: MANAGE DEMAND & REDUCE SUPPLY

BUILDING MULTIMODAL ACCESS INTO BUILDINGS’ DNA

For New Luxury Rental Buildings, Bike Rooms are a Must

As U.S. cities—and luxury renters—become more bike-friendly, amenities follow suit

BY LAMBETH HOCHWALD

ORIGINALLY PUBLISHED ON SEPTEMBER 15, 2016 | MANSION GLOBAL | SAVE ARTICLE

388 Fulton (SF): Shiny Bike Room Right on Street
This new apartment building has an ‘Uber room’ to wait for your ride
DESIGNING FOR CHANGE: MANAGE DEMAND & REDUCE SUPPLY

BUILDING MULTIMODAL ACCESS INTO BUILDINGS’ DNA

Parkmerced plans to subsidize residents’ use of Uber, Muni, BART

By Michael Cabanatuan  Updated 8:57 am, Wednesday, May 18, 2016

Car-Free Living

in partnership with UBER

Drive less. Live more.

At Parkmerced, we’re building the first large-scale, sustainable community in San Francisco. And that includes helping residents use their cars less or even live car-free. By using a ride share company like Uber, in combination with public transportation, we can drastically reduce the amount of miles traveled. For example, three people going from Parkmerced to the same area in the city can use Uber Pool to reduce the amount of miles by two thirds.

Save money and the environment.

Participating new residents can receive a monthly $100 transportation credit that can be...