Automobiles and Urban Mobility

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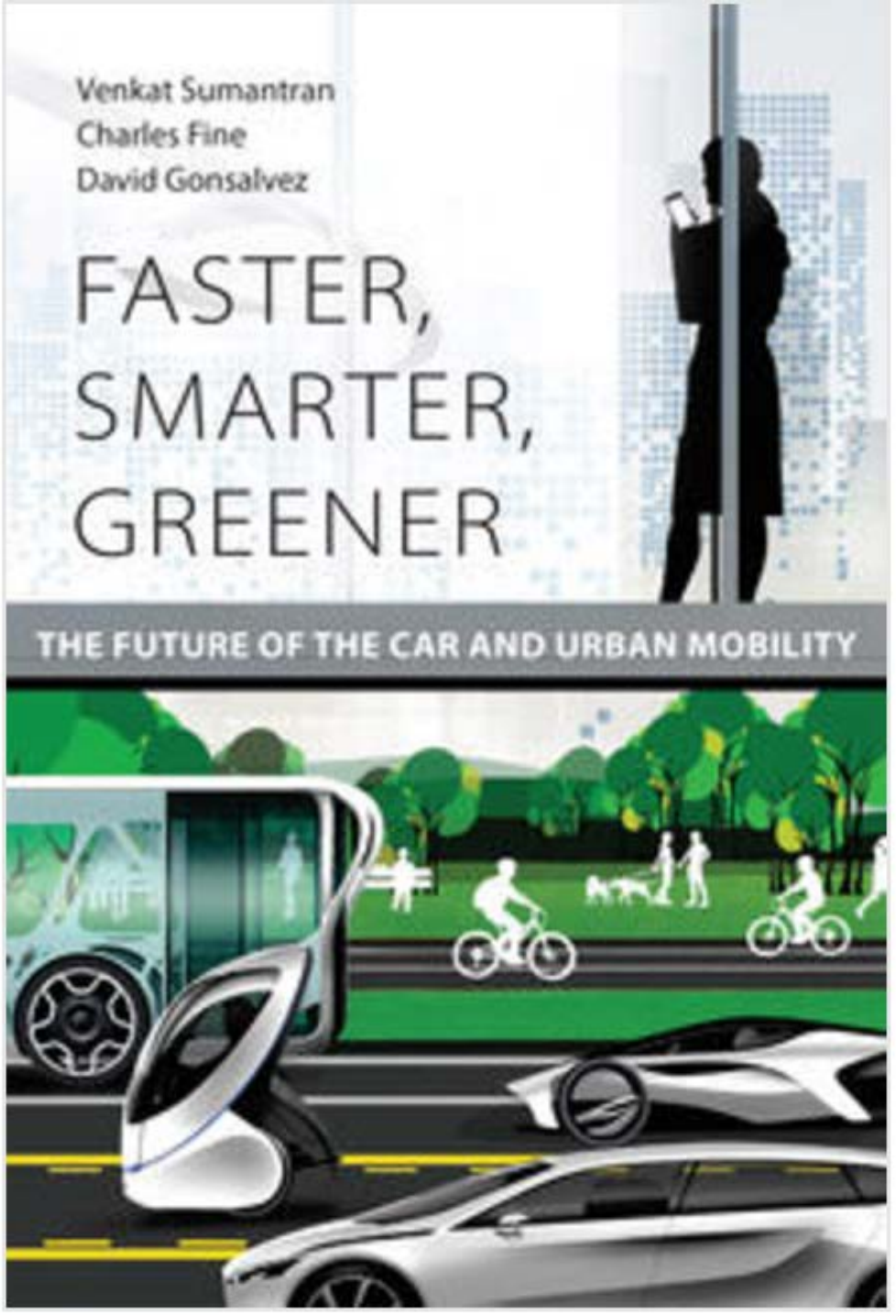


What Problem(s) are we trying to Solve?

Enable affordable mobility for urban populations, while reducing:

Local Pollution

Global Pollution (Carbon)

Congestion

What I hope to deliver:

Provide

-- a common understanding of the challenges,

-- a framework, and

-- a guideline for recommendations

about

-- automobiles and

-- urban mobility

that are both

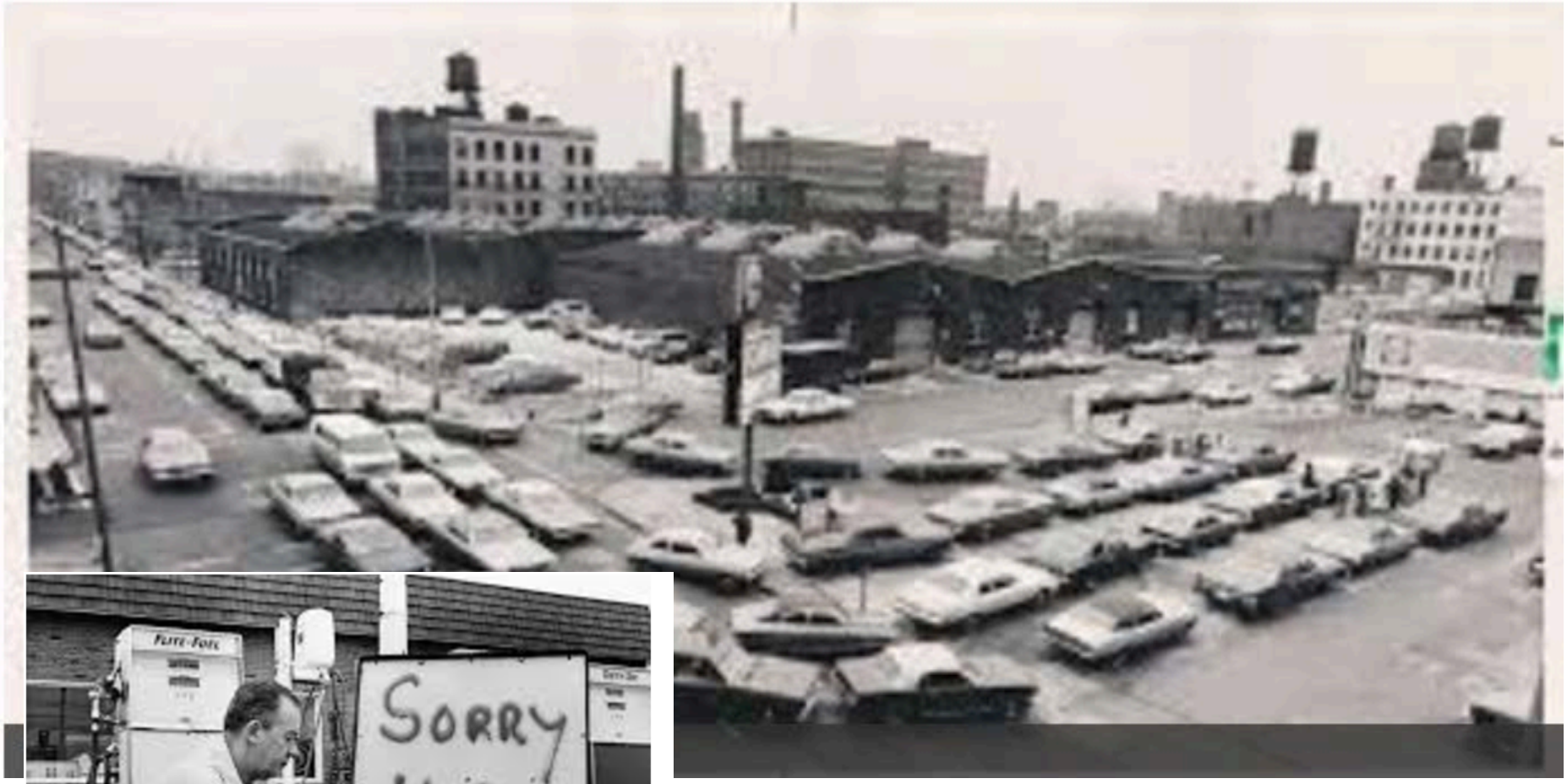
-- useful and

-- universal

Plus, support an analytic approach to crafting strategy for a mobility-centric world

Historical perspective: The Triple "Crises" of the 1970's

1. **Energy Crisis** (prices quadrupled)
2. **Pollution Crisis** (in industrialized urban areas)
3. **Manufacturing Crisis** (loss of sales and jobs, in USA particularly)




SORRY
NO
GAS

Figure 1.1 A view of the Los Angeles skyline, typically smothered in smog.
Source: Flickr. Photograph by J. Barreiros (CC BY-SA 2.0)


BEIJING 2016


Delhi 2017


TOYOTA
KILLING
AMERICAN
JOBS


U.A.W. says
"IF YOU SELL
AMERICA, BUILD
AMERICA"

Return of the Zombies (+1) in the 2010's

1. **Energy Crisis** (carbon dependence damaging planet livability)
2. **Pollution Crisis** (especially in industrialized urban areas)
3. **Manufacturing Crisis** (robotization)
4. **Congestion Crisis** (in virtually every large city)

Congestion is Universal

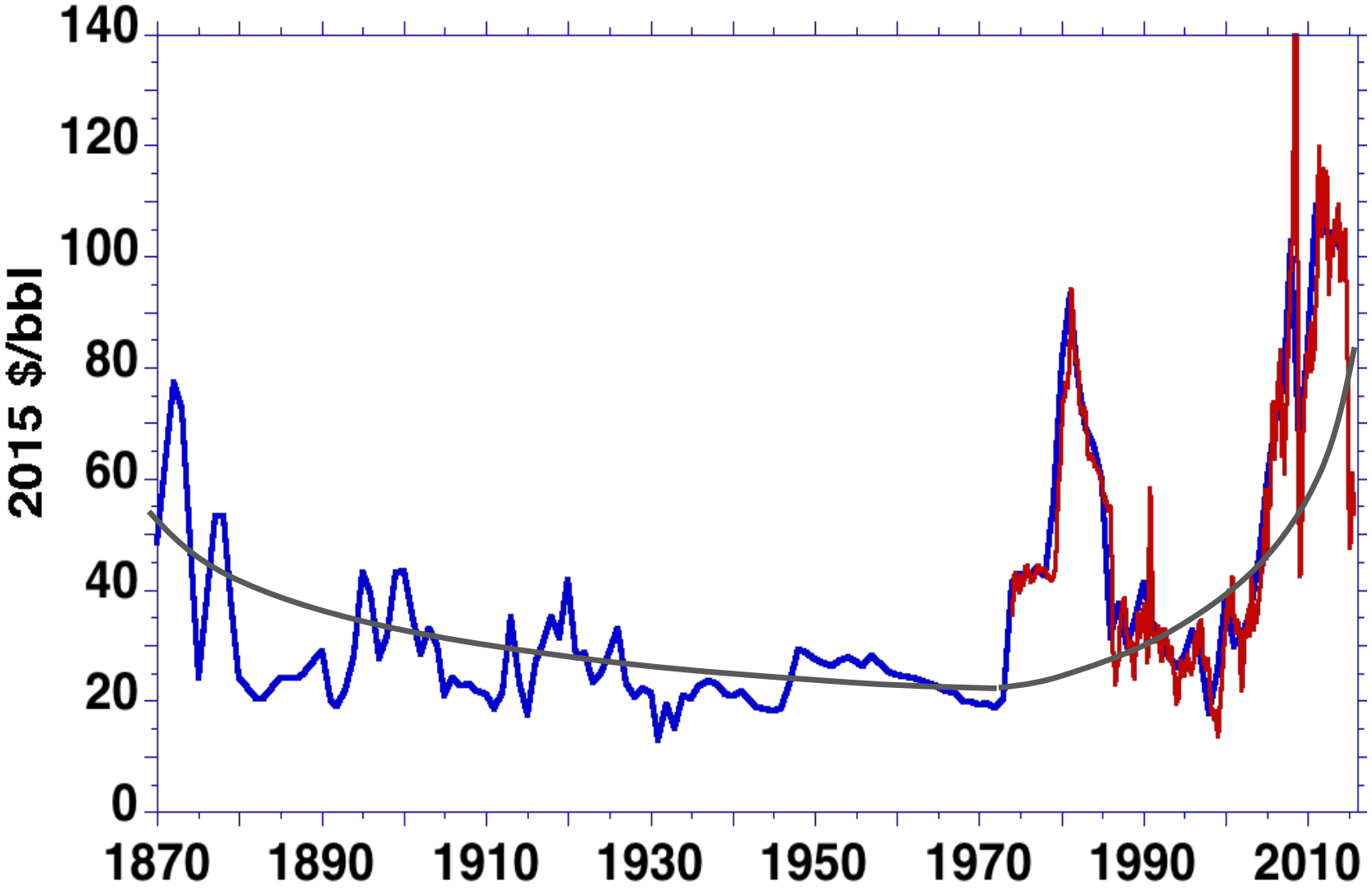
“One of the concerns about automation is that it’s going to drastically increase the miles we drive”

Stephen Zoepf, executive director,
Center for Automotive Research at Stanford.

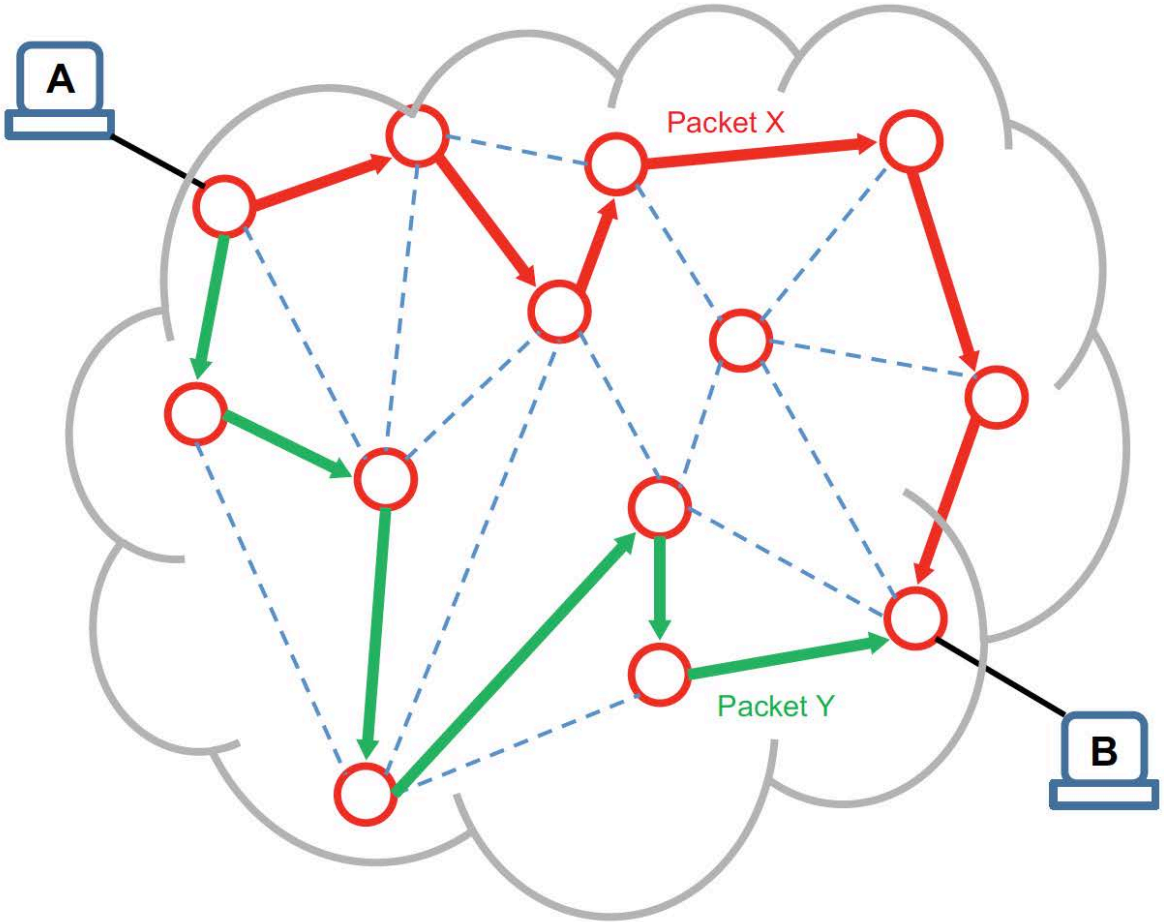
Are autonomous vehicles the good guys or the bad guys?

(Autonomous car sharing networks should reduce the number of cars, but not the total miles driven.)

Add volatility to the Crises list?
Petroleum Prices (2015$)



The Topology of Urban Mobility & Internet packets: Connected Nodes and Heterogeneous Paths



The Challenge of Urban Mobility: Will some people decide to travel *sans auto*

Vectors of Improvement: CHIP Mobility

Connected – physically and electronically

Heterogeneous – train, bus, car, share, bike, foot

Intelligent –big data analytics for best trip design across speed, cost, eco-footprint, aesthetics

Personalized – you tell the app where you want to go and what your metrics are, and it designs your trip for you -- and it learns your tastes and needs over time

Connectivity: Buses & Bikes

Figure 9.7 Modern bus rapid transit systems can offer high-capacity mobility for medium-density routes at much lower investment than underground metros.

Source: ITDP, New York.

Connectivity: Buses & Bikes

Figure 11.2 Bike racks fitted on buses are a common sight in many university towns. They help expand the catchment area for public transit.

Source: Flickr CC0 1.0 Martin Ljungqvist.

Heterogeneous Modes

More different modes

-- provide more options to more people
-- reduce dependence on any given mode
-- enable fit-to-purpose mobility
-- encourage innovation (more vectors)

Pedestrians Welcome: Seoul, Korea

a.

Bikes Welcome

Figure 9.2 Some cities have elevated the importance of bicycles on their thoroughfares. The additional level of safety and ease of use draw more commuters away from their cars.
Source: Flickr CC0 1.0 Michael W Andersen.

Making Buses Attractive to All

Figure 9.6 A modern city bus can employ a lot of the same technology that modern show cars boast—electric propulsion, zero emissions, semi-autonomous operation, and fully connected. *Source:* Daimler.

Giving up car ownership

Figure 10.1 Zipcar boosted the popularity of shared vehicles by leveraging a network-connected customer, simplifying the transaction, offering local pickup spots, and allowing very short periods of use.

Source: Zipcar.

Ford MoDeMe: Car + Bike + Parking

Figure 11.3 Ford's MoDe:Me concept. These e-bikes are folded and transported in a car and used to overcome a common hassle in cities: the lack of proximate parking.
Source: Ford Motor Company.

Waymo's Intelligent Cars: Autonomous Driving

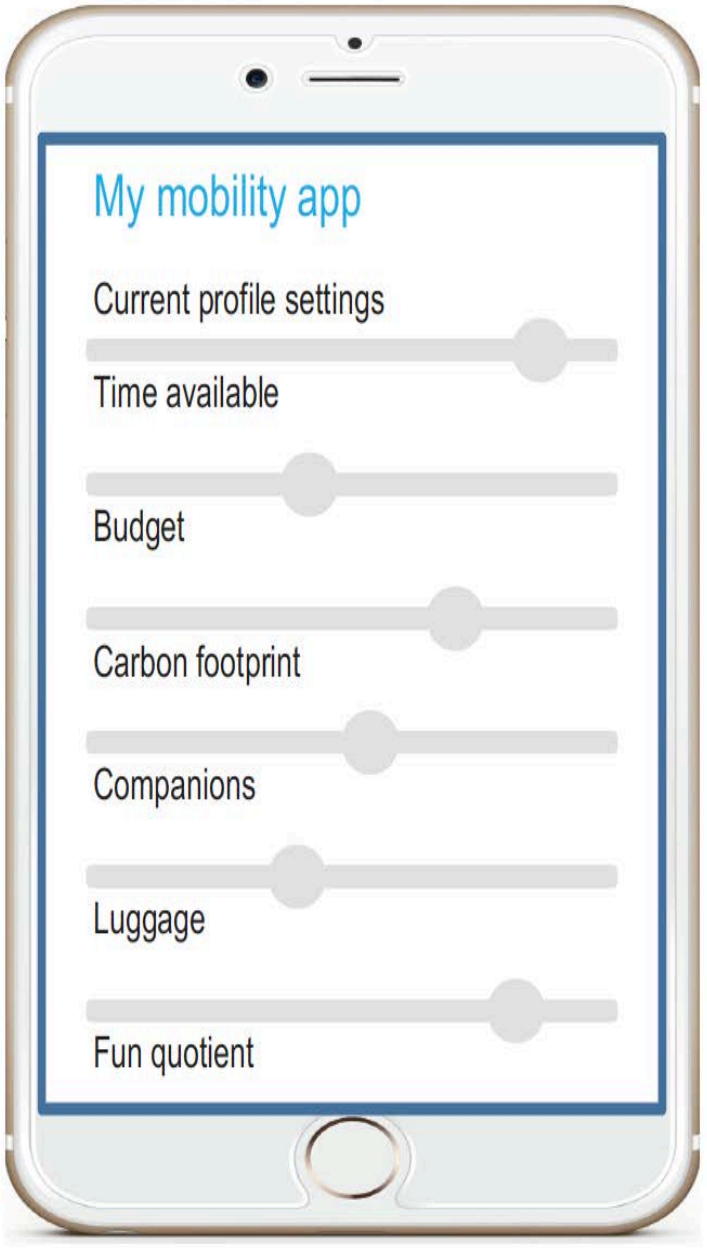
Figure 8.5 Google has been betting on reaching SAE level 5 autonomy to avoid dealing with ambiguous human interfaces. While this remains a challenging goal, the company is betting that once this is mastered, its system will carry less risk.

Source: Google

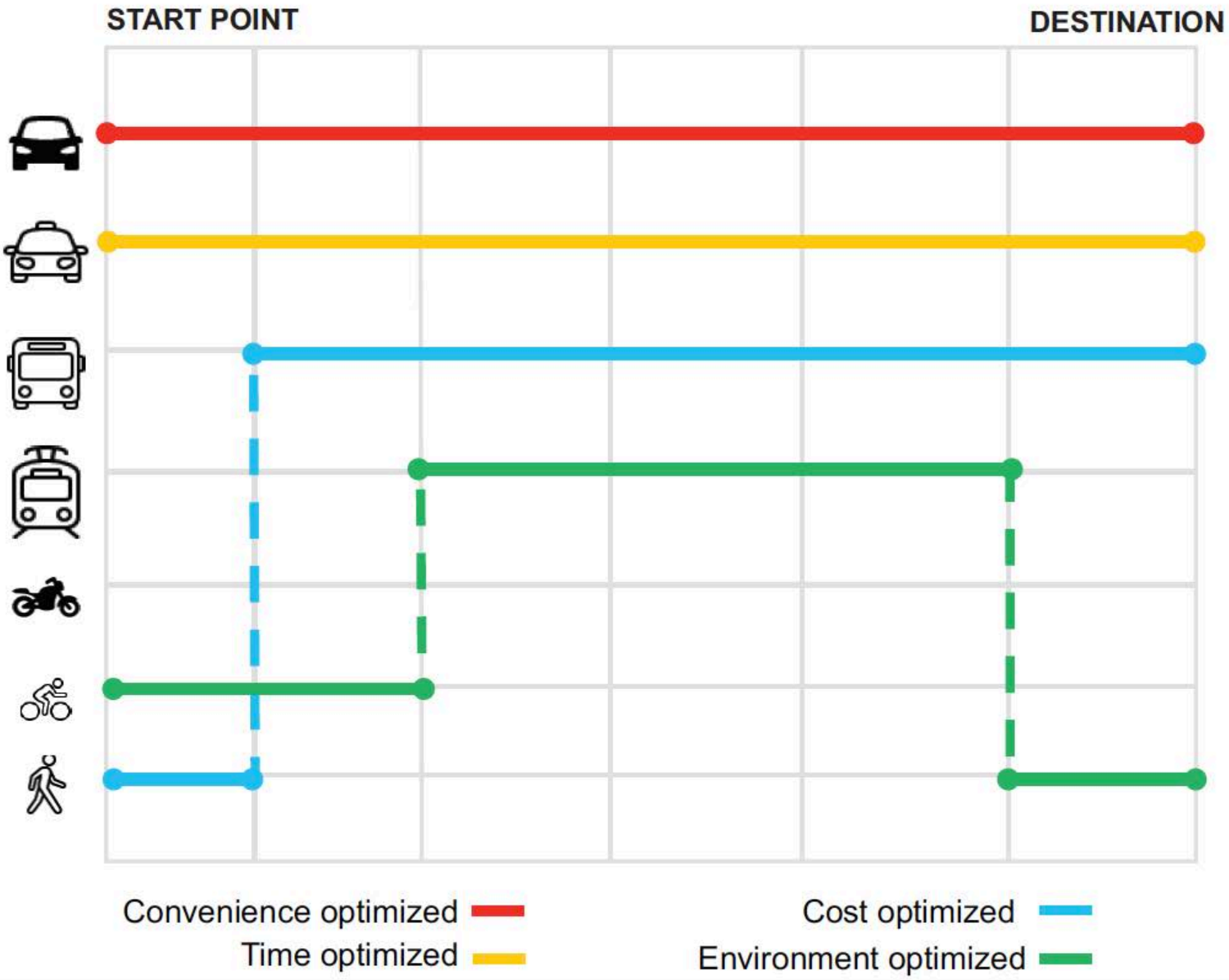
Intelligent Apps & Ride Sharing:

Political tussles:
London taxis block roads to protest Uber

Personalization: My Mobility App



Personalization: My Personal Trip



Personalization: My Mobility App Provides My Personal Trip

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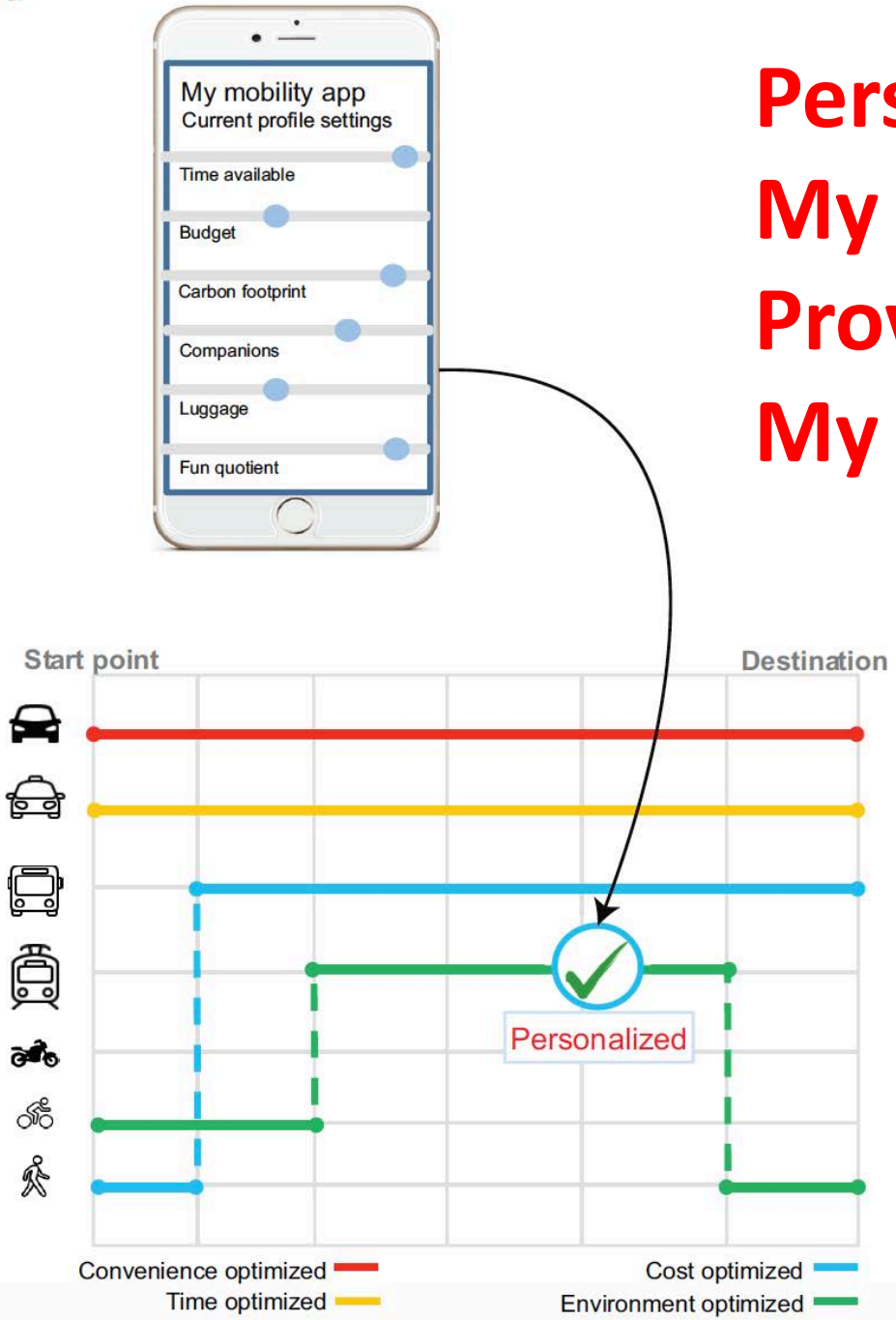


Behavioral CHIP

If we build it, will they come?

Historical love affair with cars is declining?

Has the mobile phone replaced the automobile as the *Objet d'affection ?*

How much emotional attachment to your elevator?

POSSIBLE SCENARIOS

Scenario 1:

SHARING RULES; CARS AS COMMODITIES

Scenario 2:

CARBON ZERO: CARS CURTAILED DRAMATICALLY

Scenario 3:

CAR-CENTRIC WORLD: RISE OF THE NEWBIES

Scenario 4:

CAR-CENTRIC WORLD: THE EMPIRE STRIKES BACK

How might first movers drive the ecosystems?

Big Car Companies – Trailing WayMo (& Tesla?) in autonomy?
– Trailing Tesla in electrics (but Volt/Bolt …)?
-- Trailing Uber in ride sharing ?
-- General Motors: The **Empire** Strikes Back?
-- Who are the customers: Drivers? Fleet buyers? Cities?

Powerful Tech Companies – e.g., Google, Uber, Amazon – deep-pocketed, risk capital

Entrepreneurs – selling to the big guys (e.g., Cruise & Strobe to GM)
-- more unicorns to break through? (vs. sell out)
-- power in numbers -- the Zipcars, the Ubers, the Teslas, Apps, etc.

City Planners and Government officials
– will drive the heterogeneity of results
– differentiation will be local
– transit investments, parking, road usage, bike lanes, bus lines, car pool incentives
-- can locals have global impact, e.g., CARB in CA?
-- need to provide a platform for entrepreneurship
-- need to move faster and in a more integrated way
-- get in front of regulatory issues – proactive vs reactive

Consumers – will vote with their wallets

CHIP Mobility:
Do you buy the model?

Connected – physically and electronically

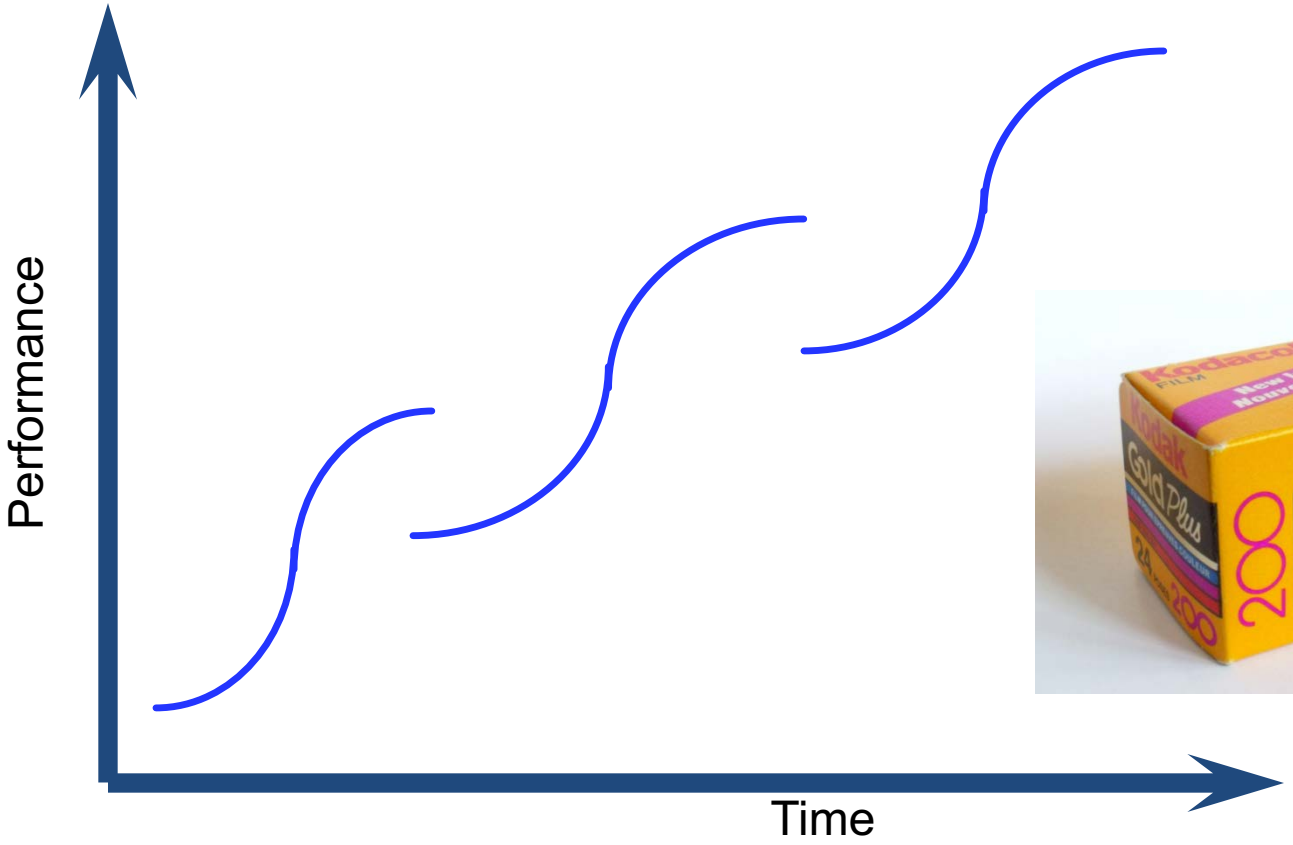
Heterogeneous – train, bus, car, share, bike, foot

Intelligent – analyze big data for best trip design across speed, cost, eco-footprint, aesthetics

Personalized – you tell the app where you want to go, what are your metrics and it designs your trip for you -- and it learns your tastes and needs over time

Backup Slides

ALL ADVANTAGE IS TEMPORARY



Technology and Industry Disruptions

	Industry Disruption	No Industry Disruption
Technology or Process Disruption	• Weak Incumbent Network Effect • Strong Entrant Network Effect • Consumer highly price sensitive and willing to risk adopting innovative service with low quality and compatibility	• Incumbents can affect switching behavior • Incumbents innovate while maintaining quality • Incumbents control complementary assets • Entrants struggle to offer quality due to lack of functional control or market power
No Technology or Process Disruption	Quadrant Not Relevant	• Strong Incumbent Network Effect • Consumers value quality and compatibility over innovation and low price

Digital music

Electric vehicles

Linux vs. Windows

CHIP Mobility

– How will it be accomplished?
-- What models might dominate?
-- Who will drive the innovation?
-- What are the business models?
-- Who will capture value?

Connectedness

Heterogeneity of Modes

Intelligence

Personalization