Consumer Perceptions on the Future of Automotive Mobility

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GAME CHANGERS

Today's Presenters

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In the Next 45 Minutes...

- Why Mobility Matters

- Trend Observations In Social Data

- Drill Down: Key Autonomous Vehicle Discussion Themes

- Current AV Understanding among Gen Z and Millennials

- Future AV Expectations among Gen Z and Millennials

Why Does Mobility Matter?

DISRUPTIVE DRIVING

ELECTRIFICATION

SHARED MOBILITY

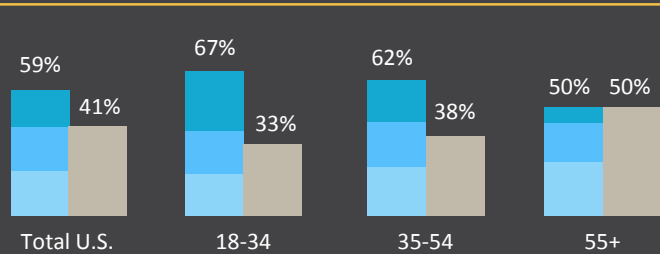| **LEVEL 0** ZERO AUTOMATION	2005 **LEVEL 1** DRIVE ASSISTANT	2015 **LEVEL 2** PARTIAL AUTOMATED	2020 **LEVEL 3** CONDITIONAL AUTOMATED	2025 **LEVEL 4** HIGHLY AUTOMATED	2030 **LEVEL 5** FULLY AUTOMATED

Cars are Central to the American Identity

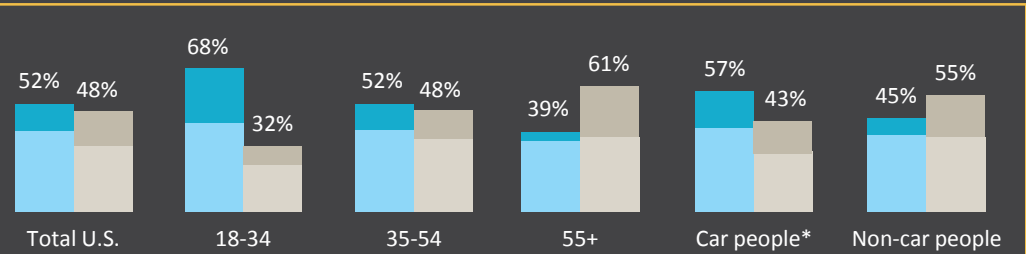**Do you consider yourself a car person or someone who is passionate about cars, trucks, motorcycles, or other vehicles you drive yourself?**

And what is your view of self-driving cars?

Legend (left chart): ■ Yes, very much   ■ Yes, somewhat   ■ Yes, a little   ■ Yes, not at all

	Total U.S.	18-34	35-54	55+
Yes	59%	67%	62%	50%
No	41%	33%	38%	50%

Legend (right chart): ■ Very positive   ■ Somewhat positive   ■ Somewhat negative   ■ Very negative

	Total U.S.	18-34	35-54	55+	Car people*	Non-car people
Positive	52%	68%	52%	39%	57%	45%
Negative	48%	32%	48%	61%	43%	55%

Among people who consider themselves "car people" in the previous question

26% of Americans "would never use" a self-driving car

Source: Ipsos surveys conducted between December 19 and 21, 2017 among 2,000 adults in the U.S.

Impact Across Industries
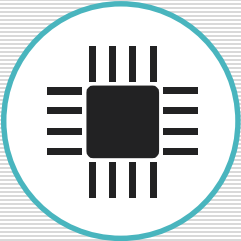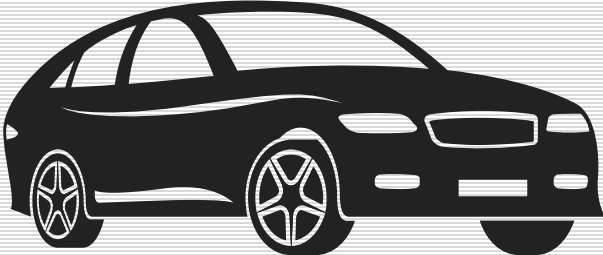
Millennial and Gen Z Perceptions

Younger consumers (below 35) are more open and interested in new features such as connectivity and autonomous driving services, while older consumers (above 50) are more reserved.

Source: *Ipsos Views - The Future of Mobility: On the Road to Driverless Cars*

Today's Research Focus

The future of automotive mobility, in the words of the consumer

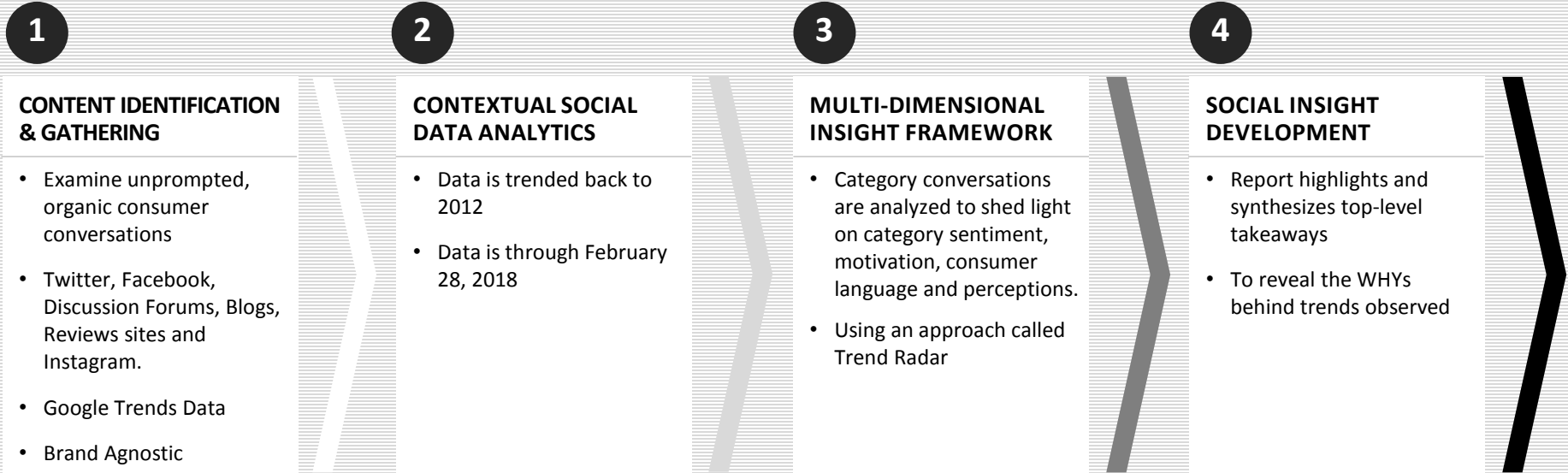**SOCIAL INTELLIGENCE**

COMMUNITY

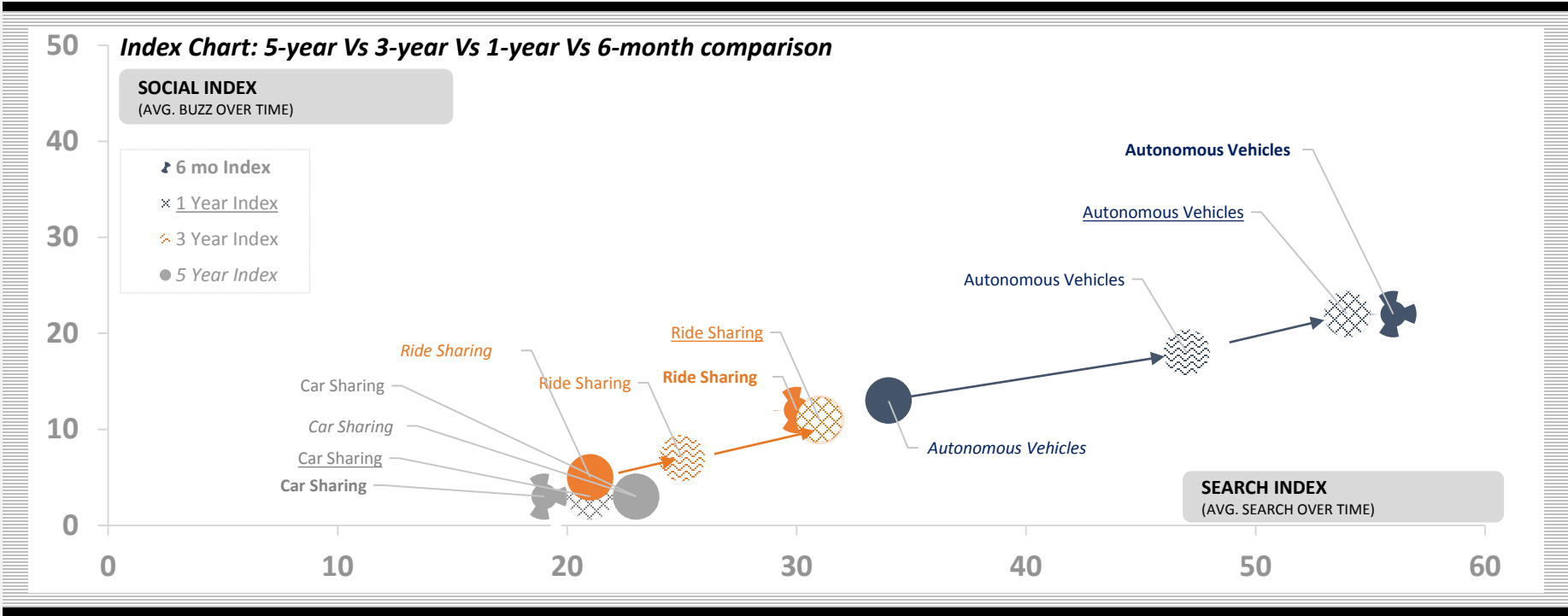Exploring the Mobility Landscape with Social Intelligence

Understanding Mobility via Social Conversations

Examining United States consumer social discussions on Autonomous Vehicles (AVs), Ride Sharing and Car Sharing to develop contextually rich insights on category habits and usage, needs, concerns, and brand associations.

METHODOLOGY

1

CONTENT IDENTIFICATION & GATHERING

- Examine unprompted, organic consumer conversations
- Twitter, Facebook, Discussion Forums, Blogs, Reviews sites and Instagram.
- Google Trends Data
- Brand Agnostic

2

CONTEXTUAL SOCIAL DATA ANALYTICS

- Data is trended back to 2012
- Data is through February 28, 2018

3

MULTI-DIMENSIONAL INSIGHT FRAMEWORK

- Category conversations are analyzed to shed light on category sentiment, motivation, consumer language and perceptions.
- Using an approach called Trend Radar

4

SOCIAL INSIGHT DEVELOPMENT

- Report highlights and synthesizes top-level takeaways
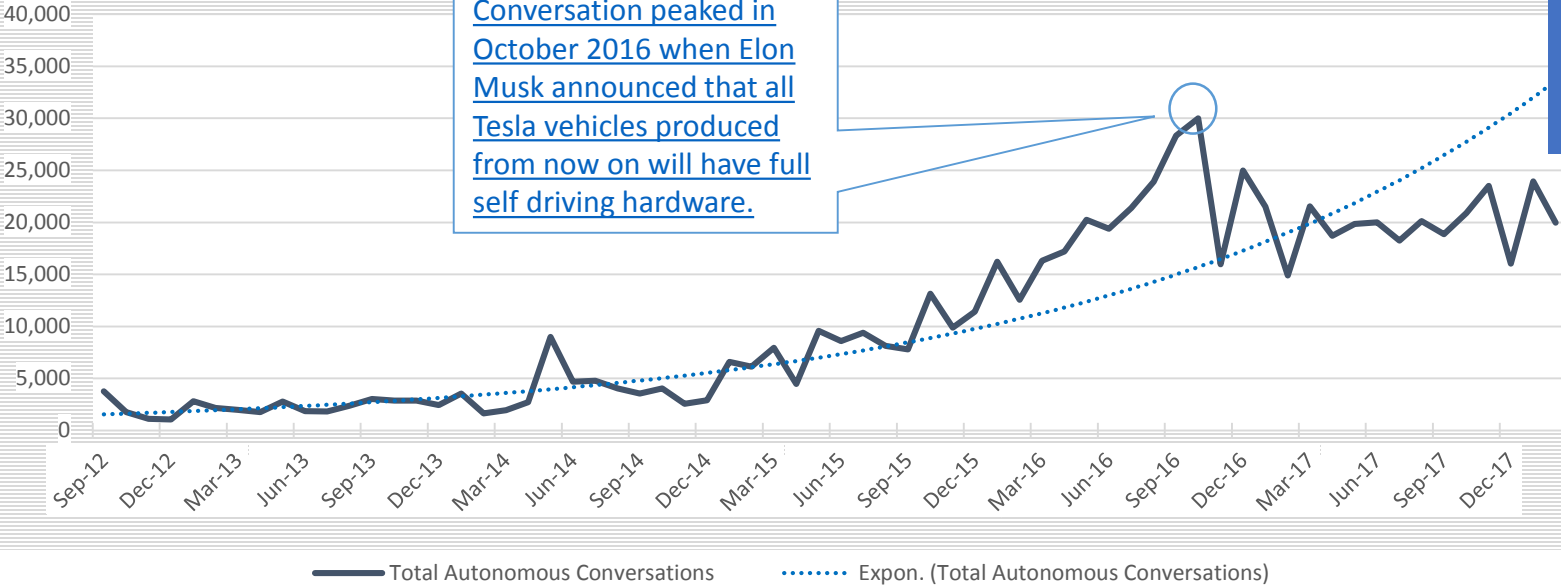- To reveal the WHYs behind trends observed

Autonomous Vehicles lead in social conversations and Internet searches while Ride Sharing increases more gradually

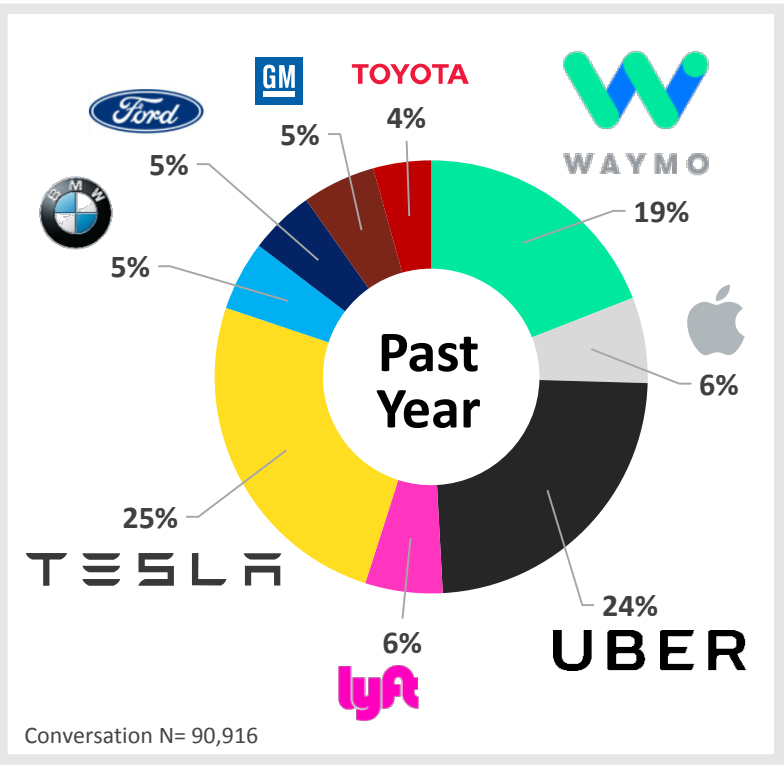Index Chart: 5-year Vs 3-year Vs 1-year Vs 6-month comparison

SOCIAL INDEX
(AVG. BUZZ OVER TIME)

- ♪ **6 mo Index**
- ✕ 1 Year Index
- ⚘ 3 Year Index
- ● 5 Year Index

SEARCH INDEX
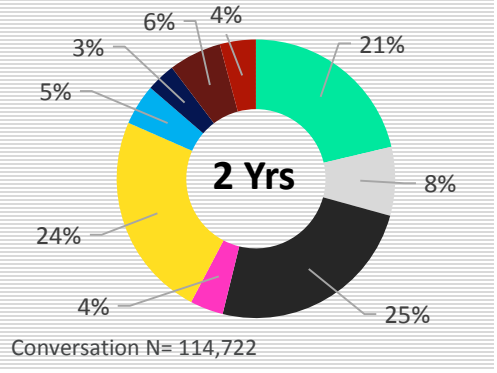(AVG. SEARCH OVER TIME)

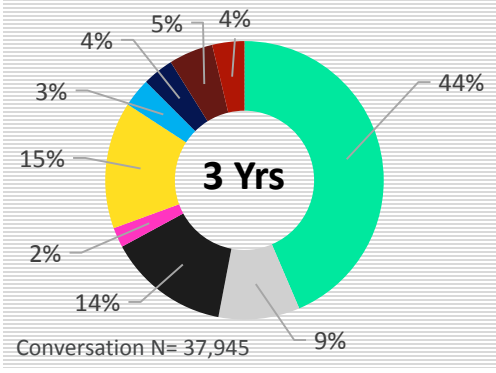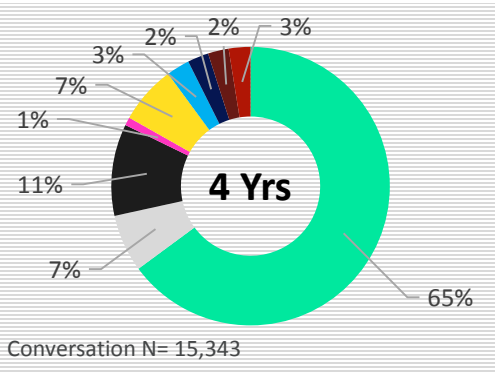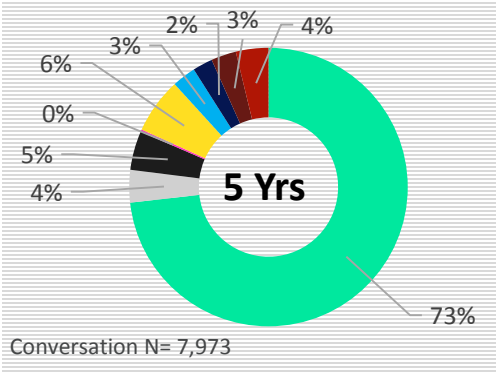Ride Sharing

Car Sharing

Autonomous Vehicles

Note: Weekly data; Social data from Crimson Hexagon averaged from February 24, 2013 – February 24, 2018; Twitter, Facebook, Blogs, Forums, Reviews, Comments, Instagram. Search Index from Google averaged from February 24, 2013 – February 24, 2018. *Ride Sharing category not inclusive of brand names like Uber, Lyft, etc

Autonomous Discussion Skyrocketed Starting in 2015 and Continues to Climb

Monthly Conversation Volume

Conversation peaked in October 2016 when Elon Musk announced that all Tesla vehicles produced from now on will have full self driving hardware.

Autonomous conversation in the P6M is 875% higher than 5 years prior

Legend:
—— Total Autonomous Conversations
······ Expon. (Total Autonomous Conversations)

Analysis timeframe: September 1, 2012 – February 28, 2018.

Where Technology and OEMs converge: Tesla, Uber, and Google winning race for Autonomous mindshare in the past year

5 Yrs
2% 3% 4% 6% 3% 0% 5% 4% 73%
Conversation N= 7,973

4 Yrs
2% 3% 2% 3% 7% 1% 11% 7% 65%
Conversation N= 15,343

3 Yrs
5% 4% 4% 3% 15% 2% 14% 9% 44%
Conversation N= 37,945

2 Yrs
6% 4% 3% 5% 24% 4% 25% 8% 21%
Conversation N= 114,722

Past Year
5% 5% 5% 4% 19% 6% 25% 6% 24%
Conversation N= 90,916

● Google/Waymo*   ● Apple   ● Uber   ● Lyft   ● Tesla   ● BMW   ● Ford   ● GM   ● Toyota

*Google filter included: Google, Alphabet, Waymo   Analysis timeframe: February 24, 2013 – February 24, 2018.

13

Drill Down on Social: Saving Time & Money

18%

Save time by:
- being efficient
- allowing passengers to work, sleep, etc.

"time is our greatest luxury- autonomous driving can give that back" #foodforthought #thinkauto @briancooley"

*"Trade off? **Shorter commutes, can do other things during commute** which will lower stress, less accidents, **lower cost of commuting (no car payments, insurance, gas, repairs, upgrades**), empty garage space can be filled with track toys"*

Save money on:
- licenses
- taxes
- gas
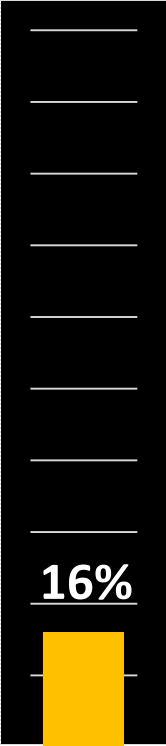- insurance
- maintenance

"The perfect storm is electric+self-driving+Uberization. Private cars used only 5% of time. Why own? Cost reduction of ~80%."

*"**Not having to pay a driver/taxi license, an electric car that is in use 80% of the day is extremely cheap** for the customer and cheaper to maintain anyway.."*

Analysis timeframe: February 26, 2017 – February 28, 2018.

Drill Down on Social: Impact on Jobs & Public Transit

16%

Taxis/Uber drivers, truckers, and all driver-related jobs will be replaced

*"But the truth is that automation means a factory that employed 10k workers 20 years ago might now employ 2.5k. **Self-driving vehicles will replace truck-drivers, cabdrivers, Uber drivers, and bus drivers. Millions of jobs.**"*
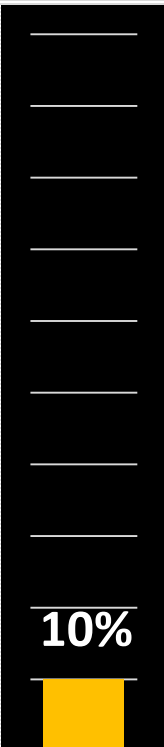
*"Being a **truck driver right now has gotta be stressful just knowing that your job is gonna be obsolete** in 5 years with self driving cars."*

Buses, trains and subway systems are expected to be negatively affected

*"I'd **rather spend tax money on public transit,etc than driverless cars.** Make @Uber and @lyft pay for it themselves."*

*"**I'm worried self driving cars will pretty much kill any proposal for public transportation at least once they become common,** but my hope is that the competition in the automated taxi market will get so fierce it will be cheaper than what the city can provide with public transportation."*

Drill Down on Social: Safety as a Key Benefit & Concern

10%

Safety benefits:
Roads will be safer and accidents will decrease

*"There is absolutely **no scenario where a human driver can handle an emergency situation as well** as a properly-designed self-driving car."*

*" …**typically car crashes aren't intentional and the whole idea behind self driving cars is that a computer doesn't doze off, can react faster, and can be more aware in 360 degrees around the car than humans can thus we can achieve a reality in which no accidents occur** because all of the cars are driven with the necessary awareness and reaction time to completely avoid any collision."*

Safety concerns:
possible mechanical malfunctions and "kinks"

*"**There are also risks with autonomous vehicles** - the potential for equipment/sensor failure, software being unable to adequately handle bad weather, the potential for exploitation by hackers etc."*

*"You seem to have a lot of faith in unproven and incredibly expensive technology. […] **I see a lot of needless death and destruction caused by these vehicles before all of the kinks are worked out.** You simply dismiss them out of hand."*

Drill Down on Social: Ownership Changes & The Environment

Positive spin – ownership will decrease in favor of SDC services, which will in turn decrease congestion and pollution
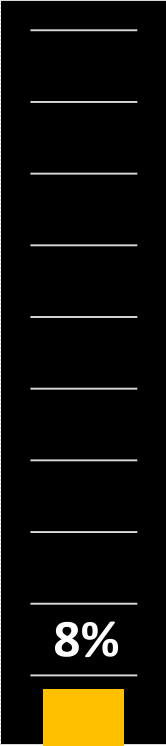
"consider two options: everyone owns their own, and driverless cars as service (think Uber but without a driver) If everyone is going to own their own - we're looking at a decades-long transition and I don't expect a self driving car"

"How awesome would it be if no one owned cars but self driving cars would show up whenever you need em? #Reduce pollution!!!"

9%

Negative spin – people will purchase their own SDCs and travel further distances at higher speeds more often, therefore worsening emissions

"Not having to drive would cause people to commute longer and longer distances, leading to more suburban sprawl and traffic congestion. As well as ever greater dependency on the automobile, more burning of fossil fuels and pollution […]"

Analysis timeframe: February 26, 2017 – February 28, 2018.

Drill Down on Social: Regulations & Liability Questions

8%

When will regulations be put into place and what will they entail?
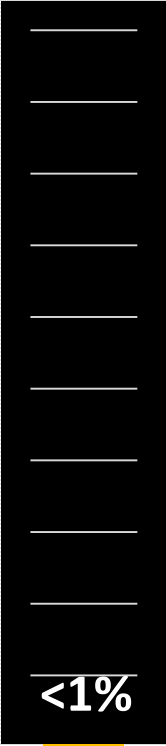
Who will be held liable in future car accidents? OEMs? Passengers? Software developers?

*"**The legal system fleshing out liability here is of paramount importance to the development of the industry.** It's important to properly balance the liability so people will want to make the self driving cars"*

*"Tesla wants to eventually make it so your Tesla vehicle will drive off while you're at work or asleep and pick up fares. **Can you imagine being liable in instance like that?** Where strangers you won't meet possibly get in a accident as the vehicle malfunctions?"*

*"**My understanding is it's coming down to how the laws are written with regards to insurance. Normally, drivers are insured.** But if the car is driving itself, does that mean the car company has to carry insurance for every car it sells? What if the problem is software and not the hardware? Then is it the software developer whose insurance picks up the tab?"*

Analysis timeframe: February 26, 2017 – February 28, 2018.

Drill Down on Social: Data Protection & Privacy Qualms

<1%

Concern exists for:
Personal data and journey history

*"Your last point is valid, I think privacy concerns exist, **all these cars will probably be connected to the so called internet of things so every journey will essentially be logged[…]"**

*"**If in some day all our cars have self driving or self aware features, then that means nearly all locations in the city are within reach of cameras and possibly microphones.** I'm not "a paranoid" about privacy stuff, but that is quite impressive nonetheless."*

Concern exists for:
Pedestrians being monitored by cars' cameras/sensors

*"I'm pretty sure that the EU will find that self-driving cars are **a violation of the privacy of people on the street, because the cars would have sensors that could detect the people**."*

*"**I believe it is only a matter of time before companies decide to profit from this data the same way social media co's profit from your personal data.** I will be surprised if 20 years from now, the camera suite onboard SDCs will not be performing **facial recognition on every pedestrian** it passes and selling the data."*

Analysis timeframe: February 26, 2017 – February 28, 2018.

Getting Even Closer to Consumers via Our Community

Current understanding of autonomous vehicles among 18-34 year-olds reveals greatest association of "hands free"

21%
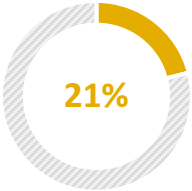
Offers a hands free steering experience
(Give up control, autonomous driving, hands free control)

16%
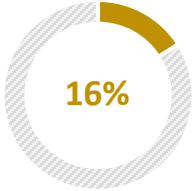
Includes tech features
(WIFI, Bluetooth, GPS navigation, satellite radio)

10%
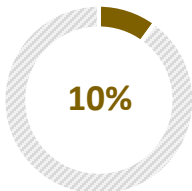
Navigates traffic efficiently
(Obeys traffic laws, follows speed limit, operates smoothly in heavy traffic)

9%

Self-parking

9%
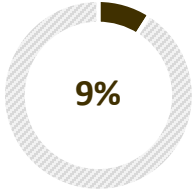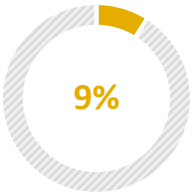
Operates via sensors
(i.e. video cameras, motion sensors)

8%
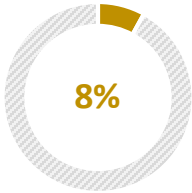
Promises greater safety

8%

Excels at braking

6%
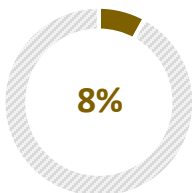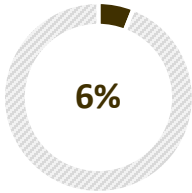
Designed to arrive at a programmed destination
(Punch in destination, car will take you there)

This generation sees self-driving cars as an abstract concept, with only some realizing how it may actually be implemented

"A self driving car is one that drives itself without a driver to maneuver or control it, it has features that can stop the car and make the car turn and go without a human touch."

"Self driving means the person doesn't have to be in total control of the car at all times, sort of like an auto pilot"

"A self-driving car is one that will not require hands on the steering wheel while the car is in motion."

"A self driving car is a full automated driving vehicle that gets you from point A to point B with its AI software and safety driving performance trough various sensors/radars."

"Most importantly, artificial intelligence software in the car that is connected to all the sensors and has input from Google street view and video cameras inside the car."

"I'm sure it has some way to input where you'd like to go, and hopefully it will have sensors to determine how fast to drive and to make sure it doesn't hit anyone/thing"

Q1. Describe what a self-driving car means to you. What is it? What types of features does it have?
Base: Total 18 – 34 year-olds (n=374)

22

While younger generations are more intrigued and excited than their older peers, concerns still remain

Intrigued - 32%

"I'm interested in them, but definitely want to wait until they are more easily accessible and get all the kinks worked out." – Female, 25

Concerned - 23%

"I know computers aren't perfect, they freeze, they glitch, they get corrupted. I fear how this would affect a self driving car. I think accidents will happen." – Female, 30

Excited - 22%

"I am excited in the possibility to the application that can result from using such vehicles. I also am excited by the reduction in car accidents." – Male, 31

Scared - 11%

"These programs are made by humans which means it is still not immune to error or hacking." – Female, 22

Apathetic - 6%

*"I'm not too interested.. I like driving! I don't think we are ready yet and there would be problems as well."
– Female, 33*

Confused - 4%

"I think that this would be a great way to move technology forward but am afraid that it will cause more traffic accidents." – Female, 32

	18 – 34 year-olds	35 – 65+ year-olds (weighted average)
Intrigued	32%	26%
Concerned	23%	31%
Excited	22%	13%
Scared	11%	16%
Apathetic/ disinterested	6%	5%
Confused	4%	2%
Angry	1%	1%

Q4. From the list below, which word best describes how you feel when you think about self-driving cars?; Q5. You mention you feel … when you think about self-driving cars. In as much detail as possible, share why you feel that way.
Base: Total 18 – 34 year-olds (n=374)

The concept of autonomous vehicles piques their interest, but have questions

"I really **like** the idea of being able to make long trips with little effort and pair rest with inexpensive travel. The concept of being able to multitask is a unique feature that would make life a little bit easier."
- **Male, 27**

"I feel intrigued because I think it is a cool **concept** and something that I've thought about for years onto why we didn't have self-driving cars a lot sooner."
- **Female, 27**

"I have questions like how does this **work** without a human? Is it safe? Have they been tested without a human riding along inside?"
- **Female, 29**

"I'm really interested in how this kind of **technology** could change our lives. In theory, it could save an incredible amount of time (think of what you could accomplish during your commute or a long drive if you don't have to worry about actually driving) and could make our roads safer."
- **Female, 30**

Q4. From the list below, which word best describes how you feel when you think about self-driving cars?; Q5. You mention you feel … when you think about self-driving cars. In as much detail as possible, share why you feel that way.
Base: Total 18 – 34 year-olds (n=374)

Younger generations are looking forward to this technology and its potential to save them time

> *"I'm looking **forward** to the **future** - I'm looking **forward** to reclaiming driving **time** to do other things […], and I'm looking forward, too, to taxi-equivalents being summon-able when you're out traveling, without needing humans."*
> **– Male, 33**

> *"Because we all need tools to make our life easier, to have more **time** to enjoy yourself and your family and that is how I see it"*
> **– Female, 29**

> *"Because it is an exciting advancement in technology. I have no idea when they will be available but the promise is intriguing."*
> **– Female, 32**

> *"I feel excited about self-driving cars because it will help me get more **work** done during my commute. It will help me be less anxious about my driving, especially at night or in poor weather conditions."*
> **- Female, 26**

Notably, a segment is concerned with the safety implications of such technological advancements, as well as possible malfunctions

> *"[I'm] concerned because of **safety** and security. [and] because of the use of computers that **malfunction**, go off line, and can be hacked.*
> **- Female, 34**

> *"We have a Google home assistant and it rarely functions as expected. Some days are better than others, but I don't even want to rely on it to operate things in my home. I think **technology** has great potential but it works better as an aide to humans rather than a replacement."*
> **- Female, 33**

> *"I have concern about **safety**. I feel that just because something is possible in **technology**, it's not always wise to develop it. I think it would be a mistake to make society lazier than what it already is."*
> **- Female, 33**

> *"As much has **human** error is a thing, **technology** not cooperating is far more common."*
> **- Female, 27**

Despite concerns, younger audiences expect safety and reliability advancements to be made

25%
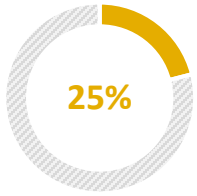
Greater safety
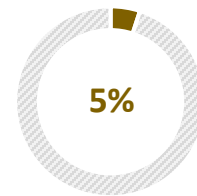(Less accidents on the road)

*"The expectations that I have of self-driving cars in the future is that **safety is a high priority**. Whatever is necessary to make sure that **accidents are a low-statistic** for self-driving cars."*

10%

Reliability
(Will reliably get you to your destination without needing to worry)

*"**I expect self-driving cars to be very reliable/dependable so I can multi-task** in them without constantly checking the road."*

6%
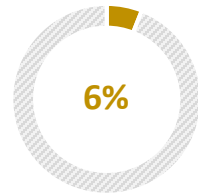
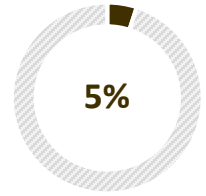**Technology**
(Tech features continuing to advance, will be fully computerized; some are still skeptical of the technology)

"For the future I love the idea of autonomous cars, which do the driving for me, and they do multiple functions much more advanced than those of today."

5%

Efficient
(Will efficiently get you to your destination – less traffic, ability to multitask while driving)

"Would be able to allow us to be transported to destinations while doing other things and being productive"

5%

Reduces / obeys traffic
(Follows all traffic laws and patterns, reduces congestion)

"They must be able to operate in accordance with lights, detect flow of traffic, etc"

Q3. What expectations do you have, if any, of self-driving cars in the future?
Base: Total 18 – 34 year-olds (n=374)

As reflected in social conversation analysis, Tesla, Google and Uber dominate autonomous top-of-mind associations

"**Tesla** is the main brand that comes to mind due to the news that they have put out regarding their self-driving cars. I have also seen news about **Apple** and **Google** trying to develop self-driving cars in the near future."
– Nick, 25-34

"I think of **Tesla** first because I think they were the first. I also think of **Uber** and a technology company like **Google**."
– Samantha, 25-34

"**Google** - leader in the industry, saw a special on this, I like the idea that they integrate what they already know (maps, traffic, satellite images) to have a leg up on competition."
– Ashley, 25-34

Q1. What are the first few brands that comes to mind when you think about self-driving cars? Please include any brands that come to mind, as well as the first few words that come to mind when you think about those brands.
Base: Total 18 – 34 year-olds (n=217)

A Glimpse Into The Future: Their Vision of AVS in 2050

"In 2050 I would travel to work by hyperloop (Elon Musk's thing), I would have a rooftop greenhouse and grown my own organic vegetables, local organic farmers would deliver organic eggs, milk, cheese, and meat, and everything else would be delivered by Amazon, I would go out using the super fast hyperloop and live on the east coast and meet up with friends in San Francisco in less than an hour."

"I feel that by the year 2050 I will be riding in a self driving car that I own. It will drop me off in the front and park itself. I wouldn't have to worry about getting lost"

"Going to work will be nice because I will have started my car from inside my home and got it warmed up and ready for me to go, then I can put on my makeup as my self-driving car takes me where I need to go. Grocery shopping will be all online, meaning I just order what I want and its waiting for me when I get home. Going out to dinner will be fun because my self-driving car will park itself, so it's like a built-in valet."

"I would imagine more work from home positions. Groceries would be ordered with the click of a mouse and delivered by drone. I could order a self-driving car that would take me to the movies or dinner with friends."

Q4. Imagine you live in the year 2050. How do you envision getting to work every day? Going grocery shopping? Going out to meet friends for dinner or a movie?
Base: Total 18 – 34 year-olds (n=217)

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Thank you!