Assignment #1 – Business Model Strategy and Industry Assessment (Total 40 Points)

Aurora
Team 6

Executive Summary:

The autonomous drive industry has a widely adopted technology roadmap with 5 levels of autonomy (exhibit 1). Except for level 4 & 5 which represent high to full level of automation, meaning driver-less, level 1~3 is dominated by ADAS (Advanced Driver Assistance Systems) technology which assists a presented driver in presumed conditions. Level 1~3 has been seen in passenger vehicles represented by Tesla Autopilot system (level 2) while only a handful of market participants are exploring real world application of driver-less level of autonomation and the technology and use cases are both pre-mature.

The industry currently consists of players from various industry backgrounds such as auto OEMs (Tesla), transportation service companies (Uber, Waymo), as well as independent technology solution providers (Aurora, Cruise (now acquired by GM)). Only Waymo and Cruise achieved level 4 application in the ride-hailing business. Other segments in terms of use cases include fleet management, public transportation, last-mile delivery and ad-hoc situations. Below overview and exhibit 2 summarizes the industry landscape.

Being an independent technology solution provider, Aurora doesn't have cash-cow businesses as financial support (OEMs), or synergy to exploit in direct use cases (ride-hailing). She will therefore choose to position herself as a differentiator addressing a narrow market as a start-up strategy. Aurora will provide a retrofitting autonomous driving package consisting of hardware and software to freight/logistics companies to be used on their fleet trucks. This offers remedy to the pain point of driver shortage in the container/bulk goods transportation and will increase logistics efficiency by minimizing costs and reducing safety issues related to human efforts. Since no other players are focusing on this segment, Aurora has the potential to gain a first-mover-advantage by configuring targeted fleets to its own systems adaptability and start to accumulate data and experience in this specific segment.

Another segment worth considering is the adoption of autonomous shuttle/bus in public transportation. Opportunities lie in scalable, long-lasting, high barrier businesses with the governments, and a potentially broader IOT and automation market in smart city design and planning. Aurora has decided to address the autonomous fleet market first because the business is more market oriented, quicker to deploy (versus long discussion and verification with governments), and also scalable. The fleet business features long haul, high using frequency, and relatively fixed routes with a non-human environment, which could potentially translate to higher revenue, easier maintenance, and reduced risk related to injury and fatality. The business model, as a result, looks into revenue sources such as % based commissions as a "virtual driver", software and data subscription fees, one-off hardware selling, customization, and installation fee, all coming with the retrofitting business (customize current trucks to adapt to the autonomous driving capability).

As a solution provider sitting in the middle of the supply chain with competitors coming from various backgrounds, Aurora doesn't have strong pricing power. To avoid being acquired as happened to Cruise by GM and AutoNomos by Waymo, Aurora will also explore co-development business model, which will bring Aurora closer to the end market. As an example, Aurora could co-develop vehicles for specific clients, forming strategic relationships with both OEM and end service providers and potentially share revenue streams coming directly from the end users.

Industry Overview:

Players	**Industry**	**Key Technology**	**Autonomous Level**	**Segments**
Waymo (Alphabet)	Software	Lidar focused +HD map	Level 4 (achieved)	Ride-hailing
Uber ATG	Ride-hailing	Sensor Fusion	Level 2 (achieved)	Ride-hailing
Cruise (GM)	Auto OEM	Sensor Fusion	Level 4 (aimed)	Ride-hailing
Tesla Autopilot	Auto OEM	Camera centric	Level 2 (achieved)	Integrated passenger car
Ford (+Argo AI)	Auto OEM	Sensor Fusion	Level 4 (aimed)	Integrated passenger car
Aurora	Independent	Sensor Fusion	Level 4 (aimed)	Autonomous fleets

Notes:

1. Sensor fusion: Lidar + Radar + Camera
2. Autonomous level: 1~5, with 4&5 realizing driver-less autonomy
3. Business models/Segments:
    - Fleet management & Operation
        - Ride-hailing & Mobility
        - Freight & logistics (autonomous trucks)
        - Public transportation (shuttle/bus) in "smart city"
        - Last mile delivery
        - Other use cases
    - Licensing & Partnership
    - Hardware/Software selling
    - Data monetization/Consulting

1. For this question you will need to use the Strategy Frameworks discussed in class, as well as the Strategy and Business Model Template that was introduced in your Innovation class. (10 Points)

- What industry are you entering? What industry segment(s) will you be pursuing with this new innovation?

Industry: Autonomous driving; Segments: Autonomous truck fleets (Other options include ride-hailing, autonomous shuttle/bus, last-mile delivery, etc.)

- Who are the key competitors in the industry, and how are they positioned?

Waymo (Alphabet), Uber ATG, Tesla, Ford (+Argo AI), GM (Cruise)

- Who are your target customers? (Please identify if the users are also the buyers.)

Target Customer: Traditional freight and logistic companies. Buyers are the users (driverless fleets).

- What is the specific Product or Service or Hybrid you will be offering?

A self-driving system with a common core of hardware and software designed to adapt to a broad set of vehicle types, from a four-door sedan to a Class 8 semitruck.

- How will you position the offering in the market?

The offering will be a differentiator serving a narrow market (see Strategy/Industry positioning table below)

- What is your value proposition to your buyers and to your users?

A remedy to driver shortage in the container/bulk goods transportation. Increasing logistics efficiency by minimizing costs and improving safety related to human efforts

Venture Strategy

1. Target Market
Fleet of trucks in goods transportation
2. Target Customer
Traditional freight and logistics companies
3. Product/Service
Autonomous driving systems consisting of retrofitting sensors hardware & AI software
4. Positioning
Long haul, relatively fixed route, fleets in scales and high frequency

5. Value Proposition
A remedy to driver shortage in the container/bulk goods transportation. Increasing logistics efficiency by minimizing costs and improving safety related to human efforts

Industry positioning

Strategic Target	Strategic Advantage: Cost Leader	Strategic Advantage: Differentiator
Broad Market		
Narrow Market	Tesla Other auto OEM (private vehicles)	Waymo (Ride-hailing) Uber ATG (Ride-hailing) Cruise (GM)(Ride-hailing) Aurora (Autonomous truck)

2. For this question you will need to use the industry analysis framework and seen below. (You can find a copy of the framework in the course materials folder.) I would like you to define the industry, and then identify the segments that make up that industry prior to completing the form. Summarize the information in text identifying why you believe the industry is attractive or not. You may add the form as an attachment. (10 Points)

The industry is dedicated to the development of self-driving cars, also known as autonomous vehicles. There are various business segments in this market. Some companies specialize in developing sophisticated software that allows these vehicles to learn and navigate their surroundings. Others specialize in producing the essential hardware components, such as sensors and processors, that enable these cars to "see." Companies are also developing advanced sensors such as lidar, radar, and cameras. Some organizations offer services for developing precise maps and navigation systems expressly for self-driving automobiles. Furthermore, firms are forming alliances to transform normal automobiles into self-driving ones. This interesting sector of autonomous vehicle technology is comprised of a combination of software, hardware, sensors, mapping, and collaborations.

The Industry Dynamics Scorecard	Facts / Data about your Target Industry	Industry Score (1-10)
The current industry segment/ niche size (i.e. sales)	The global autonomous vehicles market reached a value of approximately USD 119.14 billion in 2023 *(Expert Market Research, 2023)* Since the technology is relatively new, there is no available data to address segment/niche.	10
The current industry segment growth rates	The autonomous cars market is projected to grow at a CAGR of around 25.75% between 2022 and 2030 *(Facts & Factors, 2023)*	9
Major trends sweeping across the industry	• Internet of Things • Advanced driver assistance systems (ADAS) • Artificial intelligence (AI) and deep learning technology • Vehicle connectivity solutions *(startus-insights, 2023)*	5 Applies to everybody
The competition in the industry and evidence of successful business models	Major players include companies like Waymo, Uber ATG, Tesla, Ford (+Argo AI), GM (Cruise). Successful companies have diversified their autonomous technology applications, from passenger vehicles (Tesla, Waymo) to freight and delivery (Nuro, Einride).	5 The tech is still pre-mature; plenty options in segmentation
The activity level of new companies, venture deals, and M&A transactions	Future mobility, which includes autonomous vehicles, saw more than 142 deals, the highest in terms of deal value in 2022 *(Global Data, 2023)* Boasting nearly $1B in funding, Zoox is a subsidiary of Amazon focused entirely on developing vehicles for the robo-taxi market. With $5.5B in funding, Alphabet's subsidiary Waymo began all the way back in 2009. *(Collimator, 2023)*	4 Major players have acquired pure tech companies similar to Aurora. An exit of being acquired by players closer to end market may be down the line.
The technology life cycle stage of the industry overall, often reflected by new technologies, products, and services recently	Automation level: Level 0: No driving automation Level 1: Driver assistance Level 2: Partial driving automation Level 3: Conditional driving automation Level 4: autonomous cars: High driving automation Level 5: Full driving automation	5 Roadmap of standards are well established

announced by players in the industry	(Refer to Appendix I for more details)	
The channels of distribution within an industry	• Direct sale to OEM to integrate technology • B2B sale of technology and retrofitting customization to fleet operators • Ride-hailing and mobility service platform selling of autonomous transportation service direct to the public/end users • B2G sale of technology to Government & public service sector on providing autonomous public transportation service	8 Plenty of options with sizable market potential
There are reasonable, attractively priced suppliers for key components technologies, or ingredients that you need for your products or services	Waymo currently offers self-driving ride-hailing service in San Fransico and Phoenix area with LA and Austin on the next available area list. Though there is no publicized data on rides served, the mobile app platform offered priced rides the same way the incumbent ride-hailing companies conduct their business.	5 Segmentation varies and so as the pricing strategy. Plenty room to differentiate
Existing barriers to entry that might make your life extremely difficult as an entrepreneur	The current stringent permits requirements related to testing, registration, insurance etc.	2 Government approval is the most uncertain factor
	Total Score	53
Scoring Key: 1 to 10 where:1 is a potential showstopper for a new venture; 3 is a significant challenge; 5 is neither a barrier nor supporting success; 7 is conducive to a new venture, and 10 is an ideal setup for venture success		

3. For this question you will need to use the business model analysis framework seen below. I would like you to identify the type of business model that represents a leading competitor in the industry you have chosen. What opportunities does this model create for your new venture? (10 Points)

Leading Competitor: Waymo

BUSINESS MODEL DIMENSIONS	**Current industry Standard Business Model**	**Key Observations / Opportunities**

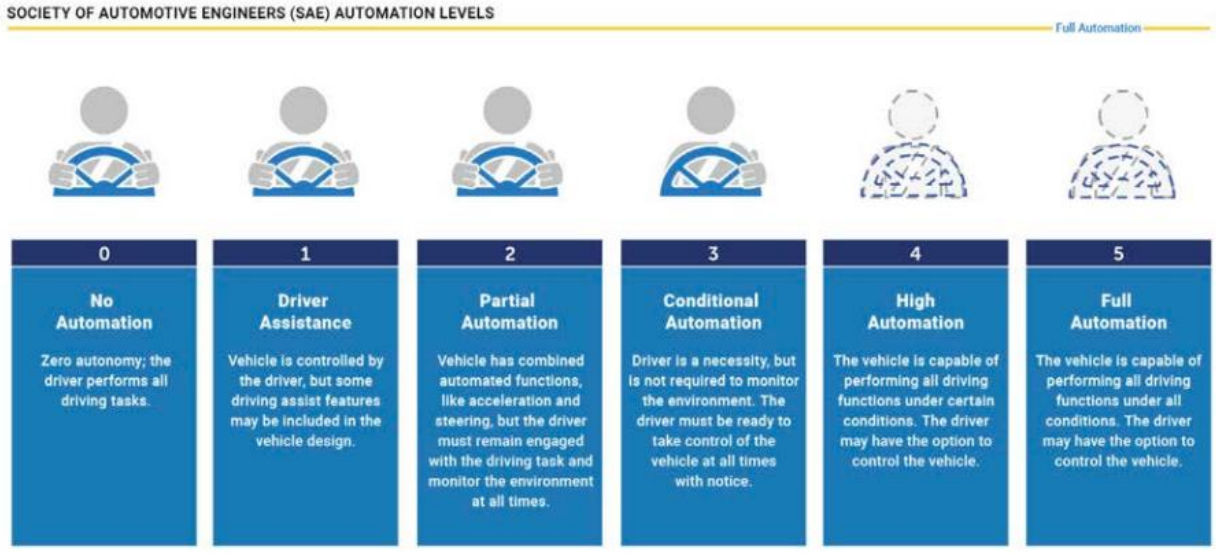
REVENUE MODEL Types of revenue Frequency of revenue Price level relative to competitors Multiple streams of revenue	• Currently minimal direct revenues such as Waymo oneapp, equipment sales, intellectual properties, subscriptions, etc. funded by Alphabet as an investment in future driverless taxi services. • Plans to generate revenue through a driverless and delivery service. • Will eventually license their technology to automakers and fleet operators.	Our venture could collaborate with Waymo to adapt their technology for trucking/logistics before they tackle that market themselves. Look to partner with established trucking company like Rivian. Could open strong connection operation between sources. Also investigate working with Amazon/Walmart logistics services.
Operating model for R&D Build technology or buy? What is the "focus" of internal versus external R&D?	• Internal R&D focuses on developing software, hardware sensors, and AI capabilities. • External R&D leverage partnerships with automakers for vehicle integration	Develop complementary technology not being focused on by Waymo, such as vehicle connectivity solutions.
Operating model for Production Manufacturing-internal or outsourced? Logistics-internal or outsourced?	• Outsource vehicle manufacturing to partners, such as Waymo. • Custom build vehicle prototypes in small volumes for testing with Waymo but look at other high activity level leaders like Ford	Provide added hardware/software solutions for mass market vehicle integration.
Operating model for Go to Market Channel? Marketing partners?	• Direct business to consumer model with app-based mobility service planned. • Could eventually license technology through B2B channels.	Focus initially on B2B channels which align better for the trucking industry.
Operating model for Customer Service Through channel partners? Direct? Tiers of customer service? Warrantees, free, charge?	• Currently testing early ride passenger transportation services to refine operational model • Will require extensive customer service for mobility services customers	Emphasize great customer service for fleet/trucking clients through a dedicated support team.

Current Resource Requirements Investment Capital, Human Capital, Partnerships Tangible & Intangible Assets, capabilities?	**Investment Capital** • Hundreds of millions to billions in startup and ongoing R&D funding • Waymo: Over $5.5B raised to date **Human Capital** • Deep AV software and automotive talent • Waymo: Hundreds of engineers and researchers **Partnerships** • Auto OEMs, suppliers, tech providers • Waymo: Fiat Chrysler, Jaguar etc. **Tangible Assets** • Prototyping and test fleet vehicles • Sensors, compute, equipment • Waymo: 600+ AV prototypes and onboard systems **Intangible Assets** • Autonomous driving IP and data • Waymo: 10+ years of AV data and software IP **Capabilities** • AV software, hardware, systems integration • Operational expertise • Waymo: Integration, fleet ops, emerging mobility services	Investment Capital • Pursue patient investors willing to fund development without near term expectation of profit Human Capital • Build multi-disciplinary team with specialized AV software talent Partnerships • Collaboration partnerships to scale deployment faster Tangible Assets • Capital-efficient retorfitting solutions for existing vehicle fleets Intangible Assets • Patent pending innovations for sustainable differentiation Capabilities • Customized account management model for commercial fleets

Appendices:

Appendix I – 5 Levels of autonomy

Automation Level	Description	Key Characteristics	
Level 0: No Automation	The human driver is fully responsible for controlling the vehicle.	No automation features; the driver performs all driving tasks.	
Level 1: Driver Assistance	The vehicle can assist with either steering or acceleration/deceleration, but not both simultaneously.	Basic driver assistance features such as cruise control or lane-keeping assistance.	
Level 2: Partial Automation	The vehicle can control both steering and acceleration/deceleration simultaneously under certain conditions. The driver must remain engaged and monitor the environment.	Advanced driver assistance systems (ADAS) like adaptive cruise control and lane-keeping assist.	
Level 3: Conditional Automation	The vehicle can perform most driving tasks autonomously in specific conditions. The driver may disengage and let the vehicle handle certain situations, but must be ready to take over when prompted.	Conditional autonomy in specific scenarios, such as highway driving.	
Level 4: High Automation	The vehicle is capable of fully autonomous driving in specific scenarios or geofenced areas. No driver intervention is required within these predefined conditions.	Full autonomy in certain environments, such as urban areas or dedicated lanes, with the ability to handle various situations.	No driver
Level 5: Full Automation	The vehicle is fully autonomous in all driving scenarios and environments. No driver is required, and the vehicle can operate without human intervention.	Complete autonomy across all driving conditions, no steering wheel or driver controls necessary.	No driver



Source: Auto Sens, 2024 ADAS Guide

Appendix II - Industry overview:

	Industry	Key Technology	Autonomous Level	Business Model
Waymo (Google)	Software + Hardware	Lidar focused	Level 4 (ahieved)	Ride-hailing
Uber ATG	Ride-hailing	Sensor Fusion	Level 2 (achieved)	Ride-hailing
Aurora	Software + Hardware	Sensor Fusion	Level 4 (aimed)	Autonomous fleets
Tesla Autopilot	Auto OEM	Camera centric	Level 2 (achieved)	Integrated
Cruise (GM)	Auto OEM	Sensor Fusion	Level 4 (aimed)	Ride-hailing
Ford (+ Argo AI)	OEM		Level 4 (aimed)	Integrated
BMW (ADAS)	OEM			Integrated
Audi	OEM			Integrated
Maimler (Mercedes-Benz)	OEM			Integrated
Hyundai	OEM			Integrated
Volvo	OEM			Integrated
NVIDIA Drive Platform	Hardware			Selling GPU
Mobileye (Intel)	Software	computer vision and collision avoidance systems		
Baidu (Apllo platform)	Software			Partnership & service, Open-source software platform as a solution

Sensor fusion: Lidar + Radar + Camera

Autonomous level: 1–5

Business models:

(1) Fleet management & Operation
- (1) Transportation & Mobility (Ride-hailing & mobility-as-a-servics (MaaS)
- (2) Logistic & Freight (Autonomous truckng, etc)
- (3) Public Transportation (Autonomous shuttle & bus)
- (4) Goods & Delivery Service
- (5) Other use cases

(2) Lisencing & partnership

(3) Hardware/Software selling

(4) Data monotization

(5) Insurance & Risk management

(6) Consulting

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