

IDS518 Midterm Exam

Tesla, Inc.

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Tesla, Inc. (formerly Tesla Motors, Inc.), is an American electric vehicle and clean energy company based in Palo Alto, California. The company specializes in electric vehicle manufacturing, battery energy storage from home to grid scale and, through its acquisition of SolarCity, solar panel and solar roof tile manufacturing.

Tesla Motors was founded in July 2003 by engineers Martin Eberhard and Marc Tarpenning. The company's name is a tribute to inventor and electrical engineer Nikola Tesla. Elon Musk was responsible for 98% of the initial funding, and served as chairman of the board. He appointed Martin Eberhard to be the first CEO. In its 2004 Series A funding, Tesla Motors was joined by Elon Musk, J. B. Straubel and Ian Wright, all of whom are retroactively allowed to call themselves co-founders of the company. Musk, who formerly served as chairman and is the current CEO, said that he envisioned Tesla Motors as a technology company and independent automaker, aimed at eventually offering electric cars at prices affordable to the average consumer. In February 2017, Tesla Motors shortened its name to Tesla.

After 11 years in the market, Tesla ranked as the world's best-selling plug-in as well as best-selling battery electric passenger car manufacturer by cars sold in 2019, both as a brand and by automotive group, with a market share of 17% of the plug-in segment and 23% of the battery electric segment. Tesla global vehicle sales increased 50% from 245,240 units in 2018 to 367,849 units in 2019.

Tesla has never had a profitable year; however, it has had several individually profitable quarters, most recently the quarters ending September 2018, December 2018, September 2019, and December 2019.

On February 20, 2020, Tesla reached a market capitalization of US\$166 billion.

History

Tesla Motors was incorporated in July 2003 by Martin Eberhard and Marc Tarpenning with 98% of the initial funds being provided by Chairman of the Board Elon Musk, who appointed Eberhard to be the first CEO. The founders were influenced to start the company after GM recalled all its EV1 electric cars in 2003 and then destroyed them, and seeing the higher efficiency of battery-electric cars as an opportunity to break the usual correlation between high performance and low mileage.

Elon Musk led the Series A round of investment in February 2004, joining Tesla's board of directors as its chairman. Tesla's primary goal was to commercialize electric vehicles, starting with a premium sports car aimed at early adopters and then moving into more mainstream vehicles, including sedans and affordable compacts.

Musk took an active role within the company and oversaw Roadster product design at a detailed level. In addition to his daily operational roles, Musk was the controlling investor in Tesla from the first financing round, funding \$6.5 million of the Series A round of US\$7.5 million with personal funds. Musk later led Tesla Motors' Series B, \$9 million of US\$13 million, and co-led the third, US\$12 million of US\$40 million round in May 2006.

Tesla's third round included investment from prominent entrepreneurs including Google co-founders Sergey Brin and Larry Page, former eBay President Jeff Skoll, Hyatt heir Nick Pritzker and added the VC firms Draper Fisher Jurvetson, Capricorn Management and The Bay Area Equity Fund managed by JPMorgan Chase. The fourth round in May 2007 added another US\$45 million and brought the total investments to over US\$105 million through private financing.

Tesla had been reporting net losses most quarters for many years, but for the quarter ending September 2019, Tesla surprised analysts, who had been anticipating a quarterly loss of approximately 40 cents per share, with adjusted earnings of US\$1.61 per share, on total quarterly revenue of US\$6.3 billion. For the quarter ending December 2019, Tesla posted adjusted earnings of US\$2.14 per share on total quarterly revenue of US\$7.38 billion.

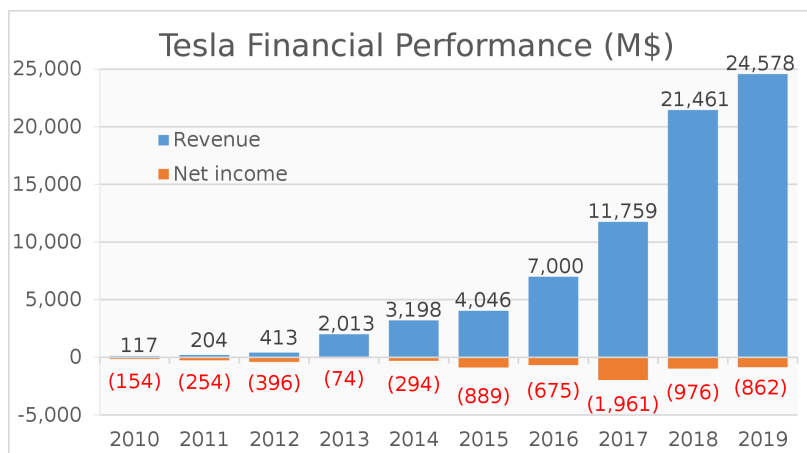


Figure 1: Tesla's Financial Performance

Strategy

Tesla's business strategy is to emulate typical technological-product life cycles and initially target affluent buyers, and then move into larger markets at lower price points. The battery and electric drivetrain technology for each model would be developed and partially paid for through the sales of earlier models. The Roadster was low-volume and priced at US\$109,000. Model S and Model X target the broader luxury market. Model 3 and the Model Y are aimed at a higher-volume segment. This business strategy is common in the technology industry. According to a Musk blog post, "New technology in any field takes a few versions to optimize before reaching the mass market, and in this case it is competing with 150 years and trillions of dollars spent on gasoline cars."

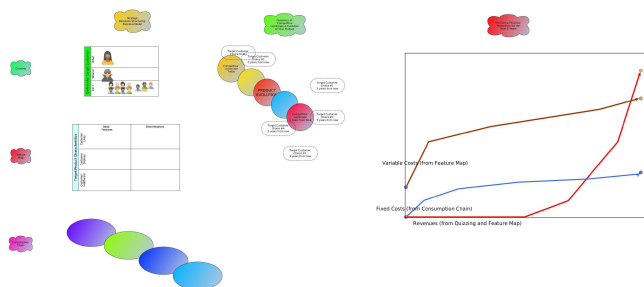


Figure 2: Think about how you will map Tesla's Demand Side

Tesla's production strategy includes a high degree of vertical integration (80% in 2016), which includes component production and proprietary charging infrastructure. The company operates large factories to capture economies of scale. Vertical integration is rare in the automotive industry, where companies typically outsource 80% of components to suppliers, and focus on engine manufacturing and final assembly.

Tesla's sales strategy is to sell its vehicles online and in company-owned showrooms rather than through a conventional dealer network. Moving towards an e-commerce strategy, customers are able to customize and order their vehicles online. (Tesla has built electric powertrain components for vehicles from other automakers, including the Smart ED2 ForTwo electric drive (the lowest-priced car from Daimler AG), the Toyota RAV4 EV, and Freightliner's Custom Chassis Electric Van.)

Tesla's technology strategy focuses on pure-electric propulsion technology, and transferring other approaches from the technology industry to transportation, such as online software updates. Tesla allows its technology patents to be used by anyone in good faith. Licensing agreements include provisions whereby the recipient agrees not to file patent suits against Tesla, or to copy its designs directly. Tesla retained control of its other intellectual property, such as trademarks and trade secrets to prevent direct copying of its technology.

Sales

Tesla just sold its 1 millionth car. Tesla delivered 367,500 cars in 2019, 50% more than in 2018 and more than triple the number sold in 2017. At the end of 2019, Tesla's global sales since 2012 totaled over 891,000 units. Year over year Tesla U.S. vehicle sales from 2017 to 2018 increased by 280% from 48,000 to 182,400. As of October 2018, Tesla's sales represented about 20% of the all-electric cars on the world's roads, according to Navigant Research. By November 2018, Tesla vehicles had traveled 10 billion miles (16 billion km).

Tesla was the world's best selling plug-in passenger car manufacturer in 2018. Shown its entire line up as of 2019 After ranking third by brand in 2017, behind BYD and BAIC, Tesla ranked as the world's best selling plug-in passenger car manufacturer in 2018, both as a brand and by automotive group, with 245,240 units delivered, capturing a market share of 12% of all plug-in cars sold globally in 2018, followed by BYD Auto with 227,152 plug-in passenger cars delivered.

In August 2015, Tesla launched a revamp of its stores to include interactive displays focused on safety, autopilot, charging network and motors. As of October 2016, Tesla operated about 260 galleries or retail locations in the United States. In June 2016, Tesla opened its first store-within-a-store: a small outpost within the Nordstrom department store at The Grove shopping mall in Los Angeles. In 2017, Tesla opened retail locations in Dubai and South Korea.

In 2017 Tesla had a US\$52 million marketing budget and used a referral program and word of mouth to attract buyers.

Products & Technology

Unlike other automakers, Tesla does not use individual large battery cells, but thousands of small, cylindrical, lithium-ion commodity cells like those used in consumer electronics. Tesla's batteries are manufactured in Gigafactories, the name Gigafactory comes from the word 'Giga,' the unit of measurement representing "billions." It uses a version of these cells that is designed to be cheaper to manufacture and lighter than standard cells by removing some safety features. According to Tesla, these features are redundant because of the advanced thermal management system and an intumescent chemical in the battery to prevent fires. Panasonic is the sole supplier of the cells for Model S, Model X, and Model 3 and cooperates with Tesla in the Giga Nevada's '21-70' cells.

In February 2016, Tesla battery cell costs were estimated at US\$200 per kWh. Tesla indicated later in 2016 that their battery cells cost less than \$190/kWh. Still later that year Argonne Labs estimated \$163/kWh at a production rate of 500,000 packs per year. In the 2018 Tesla Shareholder meeting, Elon Musk stated battery cell cost could be \$100/kWh in 2018. 2020 would bring \$100/kWh Tesla battery packs (as opposed to battery cell).

The batteries are placed under the vehicle floor. This saves interior and trunk (boot) space but increases the risk of battery damage by debris or impact. The Model S has 0.25 in (6.4 mm) aluminum-alloy armor plate. CTO Straubel expected batteries to last 10–15 years, and discounts using electric cars to charge the grid (V2G) because the related battery wear outweighs economic benefit. He also prefers recycling over re-use for grid once they reach the end of their useful life for vehicles. Since 2008, Tesla has worked with ToxCo/Kinsbursky to recycle worn out RoHS batteries, which will be an integral part of all Gigafactories.

Tesla has ongoing battery research and development work at Dalhousie University in Nova Scotia, Canada, featuring lead researcher Jeff Dahn. Tesla acquired two battery companies in 2019, Hibar Systems and Maxwell Technologies, all expected to play an important role in Tesla’s battery strategy.

Tesla makes two kinds of electric motors. Their oldest currently-produced design is a three-phase four-pole AC induction motor with a copper rotor (which inspired the Tesla logo), which is used as the rear motor in the Model S and Model X. Newer, higher-efficiency motors are used in the Model 3, Model Y, Semi, and the front motor of 2019-onward versions of the Model S and X. The permanent magnet motors increased efficiency, especially in stop-start driving.

In September 2014, Tesla Autopilot started providing semi-autonomous driver assist. Tesla upgraded its sensors and software in October 2016 (hardware version 2, or “HW2”); all Tesla cars built since then come standard with Autopilot hardware. As of 2017, Autopilot included adaptive cruise control, lane departure warning, emergency braking, Autosteer (semi-automated steering), Autopark (parallel and perpendicular parking) and Summon (recalling the vehicle from a parking place). HW2 includes eight cameras and twelve ultrasonic sensors, in addition to forward-facing radar. HW2.5 was released in mid-2017 that upgraded HW2 with a second GPU and, for the Model 3 only, a driver-facing camera. HW3 were first installed in the Model S and X in Q1 2019 and shortly thereafter in Model 3.

In April 2019, Tesla announced that all of its cars will include Autopilot (defined as just Traffic-Aware Cruise Control and Autosteer) as a standard feature moving forward. Full self-driving (Navigate on Autopilot (Beta), Auto Lane Change, Autopark, Summon, Smart Summon and future abilities) is an extra cost software option.

Model S

The Model S is a five-door liftback sedan. Deliveries began on June 22, 2012. As of February 2020, the Model S has two configurations: the Model S Long Range Plus, and the Model S Performance with EPA ranges of 390 miles (630 km), and 345 miles (555 km) respectively. Norway is the Model S’ largest European market due to the country’s incentives for the adoption of pure electric cars. As of September 2018, the Model S, with global sales of 250,000 units; the United States is the world’s leading Model S market with an estimated 136,542 units sold through September 2018.

Model 3

The Model 3, a four-door sedan, is Tesla’s third-generation car. The car was originally intended to be called the Model E, but after a lawsuit from Ford that holds the trademark on “Model E”, Musk announced on July 16, 2014 that the car would be called “Model 3” instead. In July 2017, the standard Model 3 was expected to deliver an EPA-rated all-electric range of 220 miles (350 km), while the long range model was estimated to deliver 325 miles (523 km). As of April 7, 2016, one week after the unveiling, Tesla reported over 325,000 reservations, representing sales of over US\$14 billion. As of July 2017, Tesla reported about 500,000 reservations. Bloomberg News claimed “the Model 3’s unveiling was unique in the 100-year history of the mass-market automobile.” Bloomberg compared it to the 1955 Citroën DS that took in 80,000 deposits over 10-days at the Paris Auto Show.

The Model 3 topped plug-in electric car sales in the U.S. in 2018, with an estimated all-time record of 139,782 units delivered, after being the top-selling plug-in car in the country for 12 consecutive months since January 2018, and marking the first time a plug-in car sold more than 100,000 units in a single year. The

Tesla Model 3 in 4 trims: Standard Range Plus RWD, Dual Motor AWD Long Range, Performance and the off-the-menu \$35,000 standard range. In 2019, Tesla Model 3 was the 9th best selling car in the United States.

Model X

The Tesla Model X is a mid-size crossover SUV with a lightweight aluminum body. Model X deliveries started in September 2015. It is offered in 5-, 6- and 7-passenger configurations. The passenger doors are articulating “falcon-wing” designs that open vertically.

Model Y

As of January 2020, The Tesla Model Y is being manufactured at Tesla Factory in Fremont, CA. In the future, the Model Y is also planned to be built at the yet-to-be-built Giga Berlin, newly announced in November 2019.

2020 Roadster

Musk said that this new model will have a range of 620 miles (1,000 km) on the 200 kWh (720 MJ) battery pack and will achieve 0–60 mph in 1.9 seconds; it also will achieve 0–100 mph in 4.2 seconds, and the top speed will be over 250 mph (400 km/h). The vehicle will have three electric motors allowing for all-wheel drive, and torque vectoring during cornering and the SpaceX Package which will include SpaceX cold air thrusters that will increase the speed even more.

At the time, the base price was set at US\$200,000 while the first 1,000 units, the Founder’s series, would sell for US\$250,000. Reservations required a deposit of US\$50,000, and those who ordered the Founder’s series paid the US\$250,000 in full upon ordering.

Tesla Semi

The Tesla Semi is an all-electric Class 8 semi-trailer truck first mentioned in the 2016 Tesla Master plan. Musk confirmed that two variants would be available: one with 300 miles (480 km) and one with 500 miles (800 km) of range, and that the 0–60 mph (0–97 km/h) time would be 5 seconds versus 15 seconds for a similar truck with a diesel engine. The Semi will be powered by four electric motors of the type used in the Tesla Model 3 and will include an extensive set of hardware sensors to enable it to stay in its own lane, a safe distance away from other vehicles, and later, when software and regulatory conditions allow, provide self-driving operation on highways. Musk also announced that the company would be involved in installing a solar-powered global network of the Tesla Megacharger devices to make the Semi more attractive to potential long-haul customers. A 30-minute charge would provide 400 miles (640 km) of range.

Cybertruck

The Cybertruck was unveiled on November 21, 2019, with production set for late 2021. Five days after the reveal, Cybertruck had more than 250,000 preorders.

Battery products

In April 2015, the company unveiled its Powerwall home and Powerpack industrial battery packs, and quickly received orders valued at US\$800 million. The two models included a 7-kilowatt-hour (25 MJ) wall-mounted unit and 10 kWh (36 MJ) unit. The company announced larger-scale configurations for industrial users in units of 100 kWh (360 MJ). The company planned to open source its patents for the entire range.

Supercharger network

In 2012, Tesla began building a network of 480-volt fast-charging Supercharger stations. As of December 2019, there are 1,716 Supercharger stations operated globally with over 15,000 superchargers. The Supercharger is a proprietary direct current (DC) technology that provides up to 340 hp (250 kW) of power. The navigation software in Tesla cars can recommend the fastest route for long-distance travel, incorporating possible charging delays. Almost all Tesla cars come standard with Supercharging hardware. Model S and X cars ordered before January 15, 2017 received free unlimited supercharging. All Tesla Model S and X cars ordered come with free unlimited supercharging again. Model 3 cars do not come with free unlimited supercharging.

Servicing

Tesla's philosophy is not to make a profit on service. Tesla offers service at company-owned service centers. Mobile technicians can also perform most inspections and repairs. In 2016, Tesla recommended to have any Tesla car inspected every 12,500 miles or once a year, whichever comes first.

Board of directors

As of January 2020, the Tesla board of directors consists of:

- Robyn Denholm, full-time Chairman of Tesla, Inc.; former CFO and Head of Strategy of Telstra (joined 2014) (Independent)
- Elon Musk, Co-founder, CEO and Product Architect of Tesla; founder, CEO and CTO of SpaceX; former Chairman of Tesla, Inc.; former Chairman of SolarCity.
- Ira Ehrenpreis, General Partner at Technology Partners (joined 2007)
- Larry Ellison, Co-founder, Chairman and CTO of Oracle Corporation (joined December 2018) (Independent)
- Antonio J. Gracias, CEO and Chairman of the Investment Committee at Valor Equity Partners (joined 2007). Gracias has agreed not to stand for re-election when his term expires on June 11, 2021.
- Steve Jurvetson, Managing Director, Draper Fisher Jurvetson (joined 2009). Jurvetson has agreed not to stand for re-election when his term expires on June 11, 2020.
- James Murdoch, former CEO of 21st Century Fox (joined July 2017) (Independent)
- Kimbal Musk, Co-founder of The Kitchen (joined 2004)
- Kathleen Wilson-Thompson, Senior Vice President and Chief Human Resources Officer of Walgreens Boots Alliance, Inc. (joined December 2018) (Independent)

Questions, Tasks and Deliverables

1. (15 points) Intelligence Scanning

Tesla has previously had a policy of *not* advertising their products, but now has engaged you to assess the feasibility of an Internet ad campaign for one of their products (you can choose which one)

Use web search, web-scraping and social network API's to develop an evidence based mapping of Tesla's demand side *for a single product* only.

Provide R code and output to answer some of the following questions (you don't need an exhaustive list, these are just examples) concerning Tesla's target customers:

- Who are the customers (demographics and locations)?

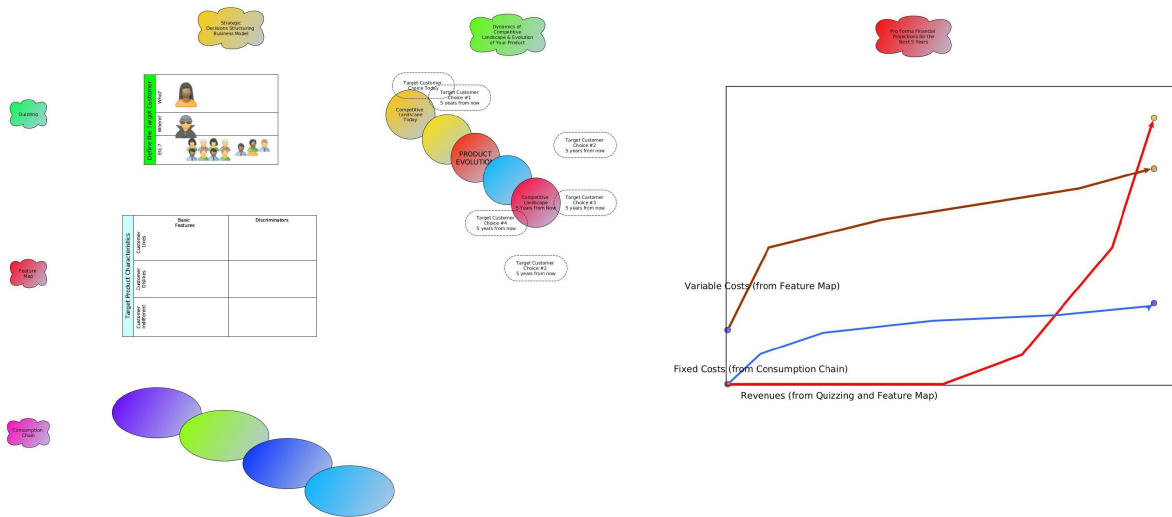


Figure 3: Demand Side Decisions for Product Marketing

- Where should you open showrooms and focus media advertising?
- What are customers looking for (features of the product)?
- When do these potential customers want to buy the product?
- Why do these potential customers want to buy the product?
- How much are these potential customers willing to pay for this product?
- What they read (context for display)?
- Who they associate with (social network)?
- How they describe their interests (keywords)?
- Where they go to buy (location and reach)?
- Why they buy (upgrades, substitutes and complements)?
- What or who influences their decisions (influencers)?
- When, how often, how much they buy (quantity, importance of customer)?

Your R code should include web-scraping using clues from **SelectorGadget** (remember this only works on the Chrome browser) and Twitter (or other social network) API's.

For the Twitter or social network analysis, choose a person, product, issue or anything else germane to Tesla on which you wish to do sentiment analysis. For example, on Twitter you would curate your tweets on some choice-combination of:

- time
- @ = people
- # = topics

Consider questions like “What is the sentiment towards this topic or person?” or “How has this sentiment evolved over time?”. Are there several groups of ‘tweeters’ that hold differing sentiments towards the focal issue or person? Is this Twitter channel being used for promotional purposes?

Using the **rtweet** package you can access Twitter;

- use the `setup_twitter OAuth()` function which uses the *httr* package.

- Get your *api_key* and your *api_secret* as well as your *access_token* and *access_token_secret* from your app settings on Twitter (click on the “API key” tab to see them).
- Perform a sentiment analysis of the tweets using the *NRC Word-Emotion Association* lexicon (available in R in the `textdata` library).

State your focal issue or person, and describe how you organized your analysis of sentiment. Use graphs, charts, tables and summaries to show:

- the sentiment towards this topic or person
- how this sentiment has evolved over time
- that there are several groups of ‘tweeters’ that hold differing sentiments towards the focal issue or person
- that this Twitter channel is or is not being used for promotional purposes?

2. (10 points) Differentiators

Based on the evidence you have gathered, identify the 2-3 product differentiators for your product

- Identify your target customer, and tell me 3 things that they are looking for (your value proposition)
- Identify your 2-3 “differentiating features” and tell me how these compare to your main competitors

3. (10 points) Competitor analysis

Map the product category space and place the competitors’ products in the market on a map (2-3 dimensions) of your differentiators

Competitor analysis starts with a review of competitors business, financial position and trends. We want in particular to know their:

- products and product plans
- sales and trends
- financial health (e.g., income or loss, EPS, etc.)

The EDGAR database at <https://www.sec.gov/edgar.shtml> offers a wealth of financial information on industry competitors, but only if they are publicly traded companies. Use package `edgar` to extract this information. You can also extract EDGAR information directly into R workspace with `finreportr`

Remember that you can identify the competitor space as a particular industry sector using SIC or NAICS codes. Tesla (excluding the battery side) operates primarily in SIC Codes 3711 and 3714 - Motor Vehicles and Passenger Car Bodies; and NAICS Codes 336111 and 336390 - Automobile Manufacturing.

Map out the competitors as:

- direct competitors who make electric cars in your price range
- skirmishers who make petrol cars in your price range
- bystanders who have the potential to compete in the future.

Indicate the strength and threat to your market from each of these.

4. (10 points) Consumption Chain

Describe the necessary marketing (only) ‘consumption chain’ activities. Describe the ‘marketing funnel’ - the sequence of activities from customer contact to purchase

- Are any of your ‘differentiators’ related to consumption chain activities that are unique to Tesla (this should be a “YES!”)
- Since you are not crafting an advertising campaign for Tesla, use web search, web-scraping and social network API’s to develop an evidence based mapping of the demand for particular activities on Tesla’s consumption chain.
- Provide R code and output to support your assertions about the unique advantages of Tesla’s consumption chain activities. You don’t need an exhaustive list; just one or two specific features that are more attractive than the competition.

5. (10 points) Strategy

Write a strategy for Internet advertising based on your findings.

- List an effective set of marketing channels for reaching your target customers and convincing them to buy your product
- Show how Tesla will compete with (1) direct competitors, (2) skirmishers, and (3) bystanders in the market.

6. (5 points) Technology Evolution

Based on the evidence you have gathered, what technologies relevant to Tesla’s product will see the fastest evolution, and how will this change the marketing strategy in the next few years.

Questions 7 through 10

Questions 7 through 10 are worth 40 points total. Points will be reallocated if a particular strategy does not require all four marketing channels.

Your marketing strategy developed in question 5 will demand specific channels, and each of the channels in questions 7 through 10 will be of more or less importance to your particular strategy. Choose the best mix of channels and estimate their cost.

Here are some benchmarks for cost estimation (since it is not always clear how effective or how much cost any particular channel will incur):

- Use Google’s Keyword Planner as a benchmark platform for a particular:
 1. target customer,
 2. audience reach (geographic location, language, demographics),
 3. and so forth.
- Consider how the costs and revenues of social, banner and video advertising channels addressing those same customers might differ.
- Assume that conversions are ~2.5% of clicks

1. this is actually quite for most Tesla products, which are pretty expensive, so modify this if needed, and justify your changes.
2. note that for branding and awareness, impressions can be as important as click-throughs.

7. (10 points) Display (Banner) Advertising

Create a Display (Banner) campaign for your Tesla product on Google's platform.

- What's your main advertising goal?
- How much are you prepared to spend? (very rough estimates of your budget are fine.)
- How many customers will you reach (impressions) at this spending level?

Note: Digital display advertising is graphic advertising on Internet websites, apps or social media through banners or other advertising formats made of text, images, flash, video, and audio.

Real time bidding (RTB) allows digital display advertisers to

- manage their activity through a (demand side platform), and
- bid to advertise to people in real time, across multiple websites,
- *based on targeting criteria*

This method allows for more control for the advertiser (or agency),

- including of the individual target audience,
- rather than just the website.

8. (10 points) Google Ads

Create a Google Ad (keyword) campaign for your Tesla product

- What's your main advertising goal?
- How much are you prepared to spend?
- How many customers will you reach (impressions and clicks) at this spending level?

Note: Here are some resources for your review:

Keyword Advertising (Planner)

Ads for Westland (Dashboard)

New Campaign

9. (10 points) Facebook Ads with Ads Manager

Create a Facebook Ads (social network) campaign for your Tesla product

- What's your main advertising goal?
- How much are you prepared to spend?
- How many customers will you reach (impressions and clicks) at this spending level?

Note: Ads Manager is a unified ads creation tool where you can to create and publish ads to

- Facebook Newsfeed
- Instagram Newsfeed
- Facebook Marketplace
- Video Feeds
- Right-hand column
- Messenger inbox

see Ads Manager and select Create.

10. (10 points) Video Advertising

Write a script for a video ad to be displayed on YouTube

- There are already a wealth of 'Tesla' ads on YouTube, so take your lead from these.

Emphasize in your script:

- Target customers (why they will watch this ad)
- Differentiators (why customers will want to buy this product)

Take cues from prior video advertising successes:

- 1950s 'Soap Operas' pioneered free TV, with commercial 'breaks' to promote sponsor's products (often soaps)
- Steve Allen's seminal Tonight Show set the format for 'integrated' advertising, where ads were woven into the script
- Early ads were comparatively crude by modern standards, and appealed to viewers in ways that would be ineffective today
- YouTube (owned by Google) is a major advertising platform which doesn't fit the traditional TV-print medium format
- Infomercials are the modern incarnation of 'integrated' advertising-shows (consider the Steve Allen / Plymouth show on Blackboard). What can you learn from them.