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Cutting-Edge Strategic Analytics Modeling at Google's (Alphabet, Inc.) Global, Hyperscale Data Centers

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ABSTRACT

Forecasting into the future has the potential to give us the tools to create a more profitable future, in the present. With strategic decision analytics and financial forecasting methods, we can cocreate a future where we are financially successful. This article utilizes several cutting-edge modeling techniques to demonstrate the potential impact of combining business strategy with state-of-the-art analytics. To date, there is a limited number of studies performed on scaling companies as large and as quickly evolving as current high-tech organizations. This study uses strategic methods and high-tech industry expertise to analyze a large technology company. It then deep dives into modeling and forecasting to demonstrate how analytics is evolving and allowing global organizations to sustainably scale, even in an exponentially fast-paced world.

Keywords**:** *data, analytics, strategy, high-tech, revenue, economics*

Lauren Strong has over 18 years of experience in analytics, statistical modeling, data science, and business. Lauren works with global organizations that specialize in excellence at scale – ranging from Fortune 500 companies to the United Nations, where she served as board member and data science strategic advisor. Lauren has worked across the full life cycle of models – from cheerleading across silos, to gaining buy-in for analytics campaigns, to identifying use cases, business and tech proposal and program requirements development, solution execution, and successful analytics-to-action conversion. She has received numerous prestigious awards for her analytics work and is a life-long learner, holding degrees from Harvard University, University of Oxford, and Northwestern University.

INTRODUCTION

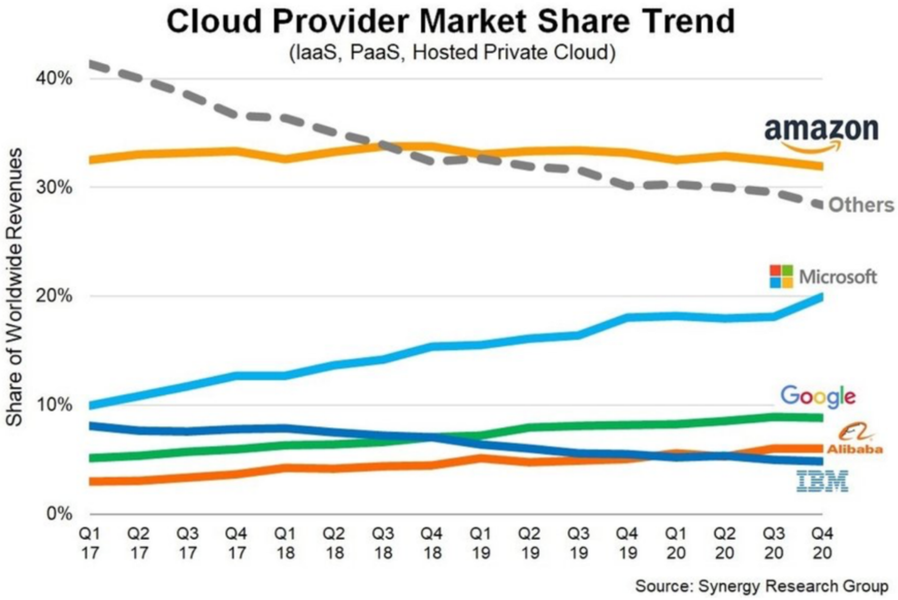
Google (Alphabet, Inc) is one of the largest companies in the world and brings in an estimated $2 million per Google employee in revenue each year (King, 2021). Part of this high revenue ratio is due to Google's infrastructure, which can support a series of products that have massive, worldwide scale. While close to 80% of their revenue comes from their ads business (Ghosh, 2021), day-to-day consumers know Google by their search engine and maps feature. Businesses across the globe, on the other hand, rely heavily on their ads offerings, and now their cloud computing offerings. As Google expands and diversifies into channels other than ads, it rapidly needs to make decisions about the best course of action to support their new, diversified growth. This article is an in-depth study of what one of those major investment decisions at Google could look like. More specifically, in this article, we focus on the "invest"/"don't invest" decision faced by Google as they look into adding a new hyperscale data center to their global infrastructure footprint. An invest/don't invest decision that costs upwards of $600 million just for the initial investment involves a lot of planning and mathematical forecasting. This article demonstrates the forecasting methods utilized by organizations such as Google. Organizations worldwide face similar invest / don't invest decisions as the world keeps quickly pivoting due to COVID-19. Consumer and market needs are quickly changing, and at the heart of that is the business decision whether or not to meet the new demand. What follows are the behind-the-scenes analyses that such a decision comprises.

CLOUD MARKET ANALYSIS

In the Q2 2021 investor report, Sundar Pichai, CEO of Google and Alphabet Inc., said, "There was a rising tide of online activity in many parts of the world, and we're proud that our services helped so many consumers and businesses. Our long-term investments in AI and Google Cloud are helping us drive significant improvements in everyone's digital experience" (Google, 2021). That optimism is warranted – their cloud revenue growth rate was 53.9% (see "Calculations" section and Appendix 2), compared to the industry cloud growth benchmark of 22.9% (Mlitz, 2021a, 2021b). Several factors are contributing to the high industry-wide growth rate. First, COVID-19 drastically shifted our world. With many citizens working from home, having virtual gatherings with relatives, and utilizing services such as online video streaming services, worldwide computing has never seen this level of demand. Our world has changed, and most of that change has been absorbed in an increased demand for computing services. Second, with lower computing costs due to recent technological advances, the price of processing big data has decreased substantially. With this decrease, more and more companies around the globe are starting to leverage data science and big data to harness growth and leverage their resources for better ROIs. This transition is happening worldwide; coupled with the COVID-19 technology accelerator, the demands for individual and organization-wide computing power are unprecedented (Mlitz, 2021a, 2021b; Appendix 3).

To meet this new demand, companies are scrambling to invest in their infrastructure while also trying to ensure flexibility to keep up with not just the scale of global demands, but also the speed at which new demands shift and come up. Longstanding players in the cloud market, such as AWS and Microsoft, were already leveraging their global footprint before Google introduced its cloud offering. While Google indeed was a later player in the cloud market, it is quickly gaining market share by leveraging the brand's reputation and company's innovative spirit to quickly become a key player in the market. With organizations worldwide worrying about reliability and security (Flexera, 2021, Appendix 4), I expect future market share growth to keep increasing for Google Cloud, as reliability is a key strength that Google has proven to excel in.

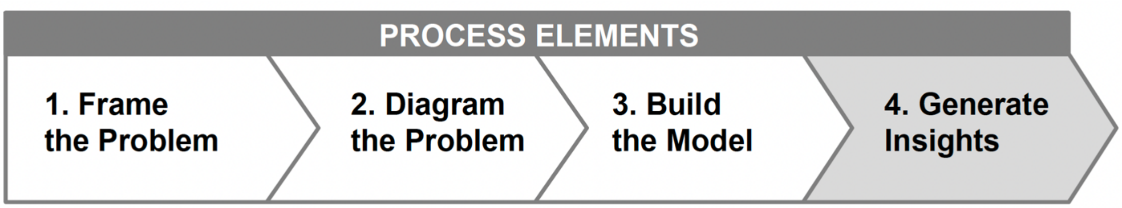
As the market continues to expand, grabbing market share now can potentially lead to exponential returns in the near future, which is critical for Google if it hopes to compete head-to-head with cloud leaders Microsoft and Amazon. As we can see from the chart below, Google's market share is increasing. The question to ask now is whether investing in a new data center at this time is a sound financial decision and whether it is warranted amid current growth rates and capacity demands.



GOOGLE COMPETITIVE ANALYSIS

Google has twenty-three data centers compared to Microsoft's two hundred. This is partially because Microsoft has been around for a longer period of time than Google, so Google is playing catch-up in terms of global span. With that said, Google's data centers are newer and thus have been able to leverage more of the recent technological advances. Also, they don't have to rely on infrastructure debt on historical data centers that no longer need to be in operation. In addition to their infrastructure pros and cons, below is a detailed SWOT (strengths, weaknesses, opportunities, threats) analysis for Google. As mentioned above in the cloud market industry section, the company has opportunities to expand with positive growth expected around the globe. With healthy profit margins and a dedicated, innovative workforce, Google is well posed to capture market share going forward. Shifting market demands as the COVID-19 situation evolves will need to be monitored, as well as competitors' actions and missteps, to allow for successful pivots of its cloud business.

With a holistic view of Google and the cloud industry behind us, we now narrow our lens to a specific investment decision faced by Google: Should we invest in a new hyperscale data center this year? Below, we begin the formal decision-making process by first framing the problem through a thorough problem structuring process, then diagramming and building the models that eventually produce insights.



STRATEGIC DECISION MODEL

PROBLEM STRUCTURING

To introduce the decision model, we follow Howard and Abbas's (2015) decision modeling approach by stating the values, decisions, and uncertainties in the model, followed by the key assumptions going into the calculations and model. From there, we perform mathematical modeling before generating outputs of insights that are then translated back into business-useful information.

Our decision scope is narrowed down to whether Google should invest or not given what we predict will be future capacity requirements placed on Google data centers. Future modeling analyses could include a later-stage decision: Should we lease out some portion of the data center, and if so, how much should we lease and at what price? For this article, we analyzed the prior case and did not include the lease/no-lease decision, but that could be included in a future analysis should stakeholders be interested.

In determining our guiding values for the decision-making process, we decided to optimize for reliability and revenue. For the reliability metric, we are making the underlying assumption that if profits can be made at a reasonable capacity level (50% or above), then the investment decision should be implemented because having at least 50% capacity demanded and availability to customers is more valuable than turning away customers in their time of need due to lack of capacity. As mentioned earlier in the Flexera (2021) report, reliability and its cousin, security, are two of the top priorities in the purchase-decision for cloud products. We think it is important for Google to be able to meet demand should demand reach a certain level, which is why we chose the 50% capacity cutoff. In addition, revenue is the key financial driver that will be measured in later analyses.

Later portions of our analysis will showcase a probabilistic approach to financial planning and forecasting. In that section, we will utilize probability theory's capacity to handle uncertainty as we add in complexity to the decision to model the real-world complexity faced by scaling organizations in today's world. This is done by creating three most-likely business scenarios that Google could face after building the data center, should they decide to invest. By adding in probabilities to each of the three scenarios, we model the expected value of the invest as well as the don't-invest decision to see which route is more profitable. The three business scenarios built into the model are outlined below.

SCENARIOS

We calculated the net present value (NPV) (Tuovila,2021) for three different potential business environments where Google faces either low demand, medium demand, or high demand.

Scenario 1:

Under the high demand scenario, 100% of data center capacity is used. We expect this scenario to occur should there be continued industry-wide high demand for cloud computing resources. We reasonably see this happening should more drastic COVID-19 situations and more reliance on virtual environments spur demand. In addition, if the increasing number of cybersecurity attacks continues to occur worldwide, we expect customers to shift towards strong branded companies such as Google, to lean on their infrastructure and high-tech security measures that are difficult for smaller providers to reliably offer. We expect the 100% demand level to occur with 40% probability.

Scenario 2:

Medium demand is defined here as 80% capacity, and we expect this outcome to occur with a probability of 50%. If this scenario did occur, we would expect it to occur under the following condition: Google maintains its current growth rate but does not sharply outpace key competitors such as Microsoft and Amazon. There is healthy industry-wide growth, and Google continues to profit from that.

Scenario 3:

Under Scenario 3, we modeled a low level of demand, listed at 50%. We estimated this outcome to have the low probability of 10%. Given Google's strong brand and the current demand from the market for reliability and surety in a shifting world, we do expect Google's situation to more align with Scenario 1 or 2, hence the lower likelihood listed. That said, should competitors snatch market share quickly, or introduce new products that eat away at Google's market share, this scenario could become more likely. In addition, the COVID-19 situation needs to be continuously monitored, and should technology usage rates decrease in favor of more in-person offerings, Google may need to pivot and reevaluate its circumstances under the new business environment.

With these three scenarios in hand, we now turn to the more financial aspects of our model. To create a discounted cash flow (DCF) model, we needed to make some key assumptions, which are listed in Table 1, and to perform some preliminary calculations, which are listed in Appendix 1. Table 1 lists the outputs of our calculations, which, combined with the other assumptions, are fed into our model below.

ASSUMPTIONS

Table 1: Assumptions

Assumptions	
Building useful life (CBRE, 2021)	39 years
Hardware and software useful life (IRS, 2021)	4 years
Update costs for hardware/software every new useful life	$200M
Average data center upkeep costs per year (Appendix 1: Calculations)	$52M
Industry cloud growth for 2020–2021 (Appendix 1: Calculations)	22.9%
Industry cloud growth for 2021–2022 (Appendix 1: Calculations)	19.58%
Gross margin for data centers (King, 2021)	60%
Revenue per Google data center (Appendix 1: Calculations)	712M
Google projected cloud growth rate (Appendix 1: Calculations)	53.9%
Average cost to build new hyperscale data center	$600M/data center
Discount rate (Appendix 1: Calculations)	11%

CALCULATIONS

See Appendix 1: Calculations

NPV MODEL

With our calculations, assumptions, and business scenarios, we now dive deep into the modeling process. For these calculations, we used a DCF model to calculate the present value (PV) of the future free cash flows (FCF) as well as the terminal value (TV). The first part of our model is shown below in Table 2 as well as the calculation used to determine the PV of each of the three business scenarios.

Table 2: First Part of Model

Google Hyperscale Data Center							
Summary							
Net Present Value ($M)	theNPV	1,037					
Internal Rate of Return (%)	calcIRR	53.0%					
Inputs							
			Change this column				
Description	**Name**	**In Use**	**Index**	**Low**	**Base**	**High**	**Notes**
Sales inputs							
Revenue at Full Capacity ($ millions)	RevenuebyCapacity	712	2		712		
Capacity Used	Capacity	0.8	2	50%	80%	100%	
Gross margin (% of sales)	pctGrossMargin	60%	2		60%		
Investment inputs							
Research & development ($ millions)	inv_RD	0	2		0		
Capital expenditures ($ millions)	inv_CapEx	600	2		600		
Working capital ($ millions)	inv_WC	52	2		51.6		
Financial and other model inputs							
Discount rate	pctDiscRate	11%	2		11%		Risk-free rate + Beta x 6% Prem = 6% + 0.84 x 6%
Inflation rate	pctInflRate	2%	2		2%		
Tax rate	pctTaxRate	20.1%	2		20.1%		
Depreciation life (years)	deprLifeYrs	8	2		8		
First year	yrFirst	2022	2		2022		
Last year	yrLast	2031	2		2031		

To complete our model, we calculated the present value of each scenario with the following calculation:

$$P_0 = \frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \frac{FCF_3}{(1+r)^3} + \cdots \frac{FCF_n}{(1+r)^n} + \frac{TV_n}{(1+r)^n}$$

$$\text{Where: } TV_n = FCF_n * (1+g)/(R_{e-g})$$

The detailed NPV model for Scenario 2 (80% capacity) is shown below in Table 3.

Table 3: Second Part of Model

Time-series inputs										
Year	theYear	2022	2023	2024	2025	2026	2027	2028	2029	2030
Investments as a % of total (backed into from Ex. 10)										
Capital expenditures	tsInp_pctInv_CapEx	100%	0%	0%	0%	0%	0%	0%	0%	0%
Calculations		**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Annual investments										
Capital expenditures - building ($ millions)	Calc_Inv_CapEx_Build	400	-	-	-	-	-	-	-	-
Capital expenditures - software/hardware ($ millions)	Calc_Inv_CapEx_Hard	200	-	-	-	200	-	-	200	-
Working Capital	Calc_Inv_WC	-	52	52	52	52	52	52	52	52
Total	Calc_Inv_Total	400	52	52	52	52	52	52	52	52
Cumulative investments										
Capital expenditures - building ($ millions)	Calc_CumInv_CapEx	400	400	400	400	400	400	400	400	400
Capital expenditures - software/hardware ($ millions)	Calc_CumInv_CapEx_Hard	-	-	-	-	200	200	200	400	400
Working Capital ($ millions)	Calc_CumInv_WC	-	52	103	155	206	258	310	361	413
Total	Calc_CumInv_Total	400		503	555	806	858	910	1,161	1,213
Revenue										
Revenue ($ millions)	Calc_Rev	-	570	570	570	570	570	570	570	570
Discount factor	Calc_DiscFact	90%	81%	73%	66%	59%	53%	48%	43%	39%
Cash flows ($M)		**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Revenue	CF_Rev	-	570	570	570	570	570	570	570	920
Gross profit	CF_GM	-	342	342	342	342	342	342	342	552
Depreciation	CF_Exp_Depr	-	(56)	(56)	(56)	(56)	(56)	(56)	(56)	(56)
EBIT	CF_EBIT	-	286	286	286	286	286	286	286	496
Taxes	CF_Taxes	-	-57	-57	-57	-57	-57	-57	-57	-100
EBIAT	CF_NOPAT	0	228	228	228	228	228	228	228	396
Less: Capital expenditures	CF_CapEx	(400)	-	-	(200)	-	-	(200)	-	-
Plus: Depreciation	CF_Exp_Depr	-	(56)	(56)	(56)	(56)	(56)	(56)	(56)	(56)
Less: Change in Working Capital	CF_IncWC	-	(52)	(52)	(52)	(52)	(52)	(52)	(52)	(52)
Free Cash Flow (FCF)	CF_FreeCF	(400)	233	233	33	233	233	33	233	401
Terminal value (based on FCF2009)	CF_TermVal	-	-	-	-	-	-	-	-	1,230
Total FCF (FCF2001-8 + TV)	CF_TotalFCF	(400)	233	233	33	233	233	33	233	1,630
Discounted FCF	CF_DiscFCF	(360)	189	170	22	138	124	16	101	637
Net Present Value	CF_NPV	1,037								

The output of our model provided the following outputs: Scenario 1's NPV = +$1,567M, Scenario 2's NPV = +$1,037M, and Scenario 3's NPV = +$242M.

As long as the NPV of a project is positive, it is likely a sound investment decision and should be given the green light. The flexibility of this model and its ability to handle uncertainty helps us understand the range of possible values of this investment decision. We see that the maximum value gleaned from this investment decision is under Scenario 1 with an NPV of 1.567B. On the lower end of the spectrum, the 50% demand level shows a much smaller but still positive value of $242M. Because 50% demanded represents a large amount of data being used, we still recommend this investment decision despite the lower NPV because 50% demand constitutes a large number of clients, and being seen as reliable and available by such a large number of customers creates positive synergies across Google's other business lines. It can thus contribute an even higher amount of revenue than predicted from this model. Another insight gleaned from this model is that should the capacity level fall under 45%, there would be a negative NPV. This suggests (without taking into account the possibility of leasing the unused capacity) that if there is a strong prediction that at least 45% capacity can't be held for the eight years of useful life, this investment should not be undertaken from a revenue standpoint alone. With that said, leasing can add additional revenue, and brand synergies can contribute meaningfully to revenue streams across Google, so a case-by-case decision is warranted.

To take our decision analysis a step further, we wanted to add complexity into the model to represent real-world complexity and use a probabilistic approach to glean more insights from our data. The below Figure 1 and mathematical findings represent this undertaking.

DECISION TREE

To begin our decision tree modeling, we first calculated the prior expected utility with the following equation from Murphy (2012):

$$EU(d=1) = \sum_{o=0}^{2} p(o)U(d,o)$$

= 0.1 * (242) + 0.4 * (1,037) + 0.5 * (1,567) = $1,170

And given

$$MEU = \max\{EU(d=0), EU(d=1)\}$$

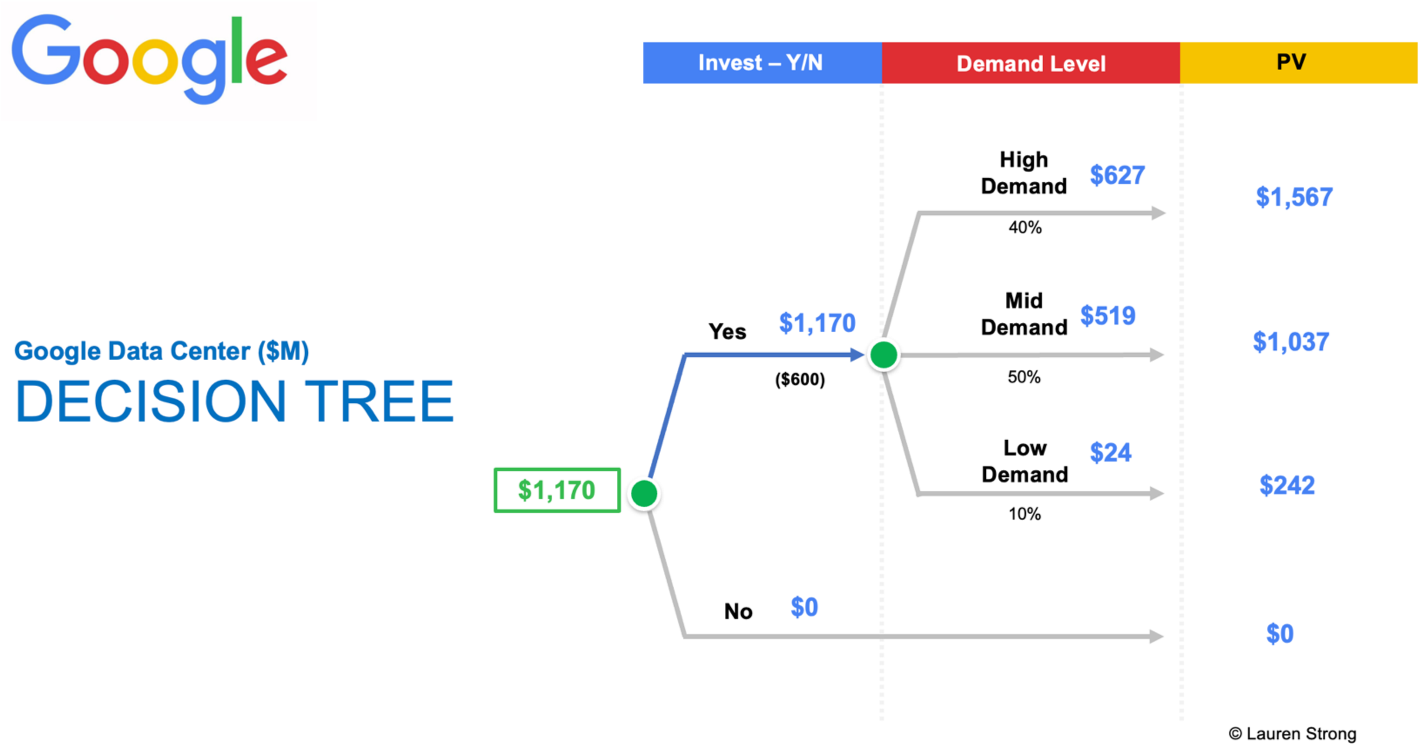
the optimal decision is

$$d^* = \arg\max\{EU(d=0), EU(d=1)\} = 1$$

Given that
d = 0 = don't invest
d = 1 = invest
o = 0 = 50% capacity demanded
o = 1 = 80% capacity demanded
o = 2 = 100% capacity demanded

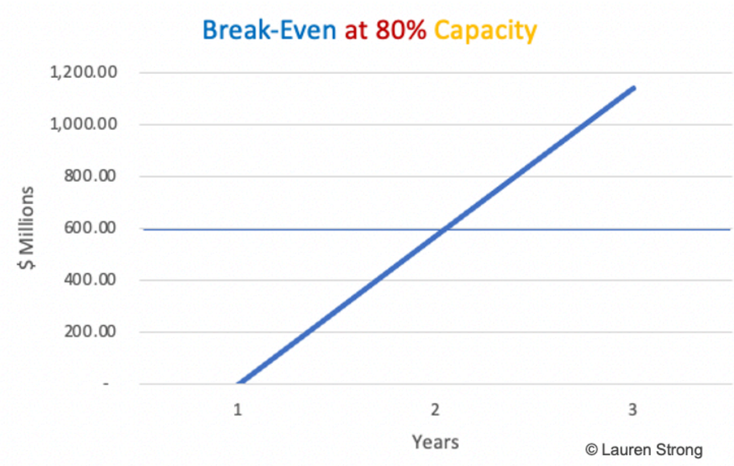
	o = 0	o = 1	o = 2
d = 0	0	0	0
d = 1	$242M	$1,037M	$1,567M

Figure 1: Decision Tree



Performing these mathematical operations led us to the decision tree shown below. The output was an "invest" expected value of +$1,170M. If the given assumptions hold true, the data center investment will reach break even within two years, shown below in Figure 2.

Figure 2: Break-Even Analysis



SUMMARY/RECOMMENDATIONS

We recommend that Google capitalize on the current market condition, where cloud market growth is accelerating and where user demand is unprecedented, by investing in the new, hyperscale data center. We recommend this based on the expected value analysis that resulted in a strong, positive value as well as the modeling performed on three of the most likely business scenarios. We do heed caution if predicted capacity falls below 45%, as that results in a negative NPV, and investing under those circumstances goes against financial and economic best practices. However, since each case is complex and features its own complexity, should the projected capacity fall below 45%, there are still viable ways to make the investment work, such as leaning on synergies across business lines and leasing out part of the unused data center.

As Google benefits from the abnormally high data center profit margins of around 60% (King, 2021), we recommend investing now in what could be a break-through investment. Should its ads continue to grow positively, we recommend utilizing synergies across segments to cross-sell and up-sell between its data center offerings and its other business lines. Google benefits from a world increasingly relying on technology, and it benefits from its own economies of scale. We hope that with this investment analysis, Google is well-poised to take on its competitors and has the information needed at hand to quickly pivot where the market takes it.

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APPENDIX

Appendix 1. Calculations

A) Google Cloud Growth Rate:

Q2 2021 Cloud Revenue/Q2 2020 Cloud Revenue = 4,628M/3,007M (see Appendix 2) = 53.9% YoY

B) Revenue Per Google Cloud Data Center:

Key assumption: 6.5 Google data centers are currently being used to contribute to the Cloud revenue of 4.628B.

4.628B/6.5 = 712M/year revenue per data center

C) Yearly Data Center Working Capital:

Average cost to build a data center is $215M (Day and Pham, 2021)
For hyperscale data centers, the average cost is $600M to build (Google, 2021)
Yearly working capital cost of average data center = 18.5M/year (Day and Pham, 2021)
Average data center = 600M/215M = 2.79x hyperscale multiplier.
Assuming the costs and revenue are proportional between average data centers and hyperscale ones:
18.5M/year * 2.79 hyperscale multiplier = 51.62M/year working capital

D) Industry Cloud Market Growth Rate

2020–2021: 332B/270B = 22.9%
2021–2022: 397B/332B = 19.58%

E) Discount Rate:

Discount rate = Risk-free rate + Beta x 6% Prem = 6% + 0.84 x 6%

F) Probability Calculations:

$$EU(d=1) = \sum_{o=0}^{2} p(o)U(d,o)$$

$$= 0.1 * (242) + 0.4 * (1{,}037) + 0.5 * (1{,}567) = \$1{,}170$$

And given

$$MEU = \max\{EU(d=0), EU(d=1)\}$$

the optimal decision is

$$d^* = \arg\max\{EU(d=0), EU(d=1)\} = 1$$

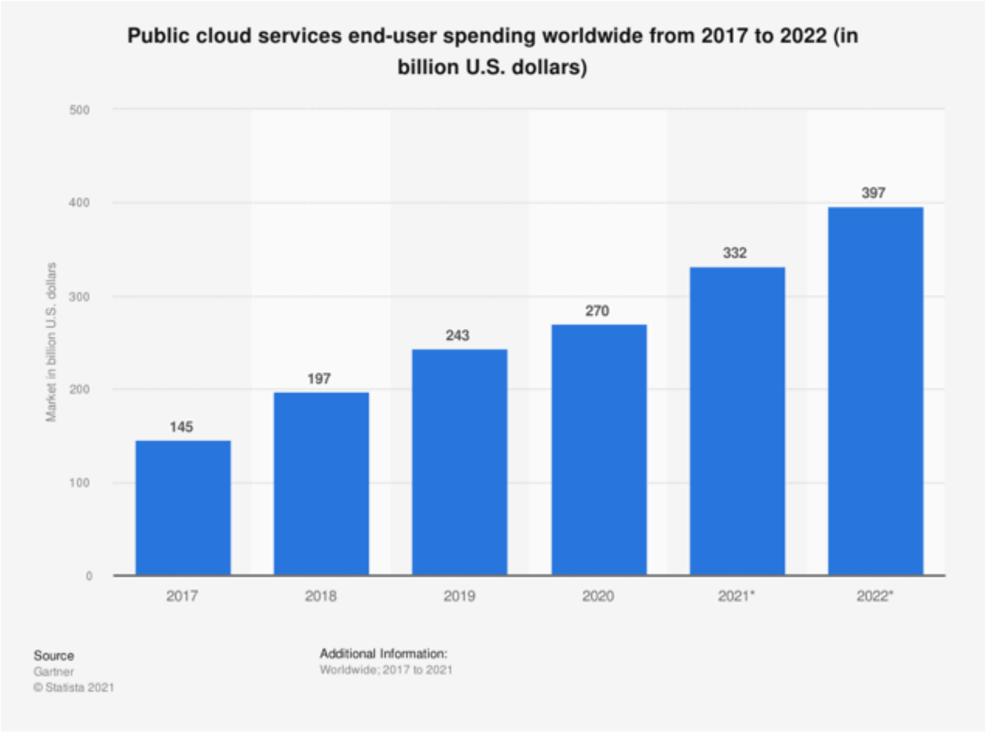
Given that:
d = 0 = don't invest
d = 1 = invest
o = 0 = 50% capacity demanded
o = 1 = 80% capacity demanded
o = 2 = 100% capacity demanded

	o = 0	o = 1	o = 2
d = 0	0	0	0
d = 1	$242M	$1,037M	$1,567M

Appendix 2. Google Financial Statement (Q2, 2021)

	Quarter Ended June 30,	
	2020	2021
Google Search & other	$ 21,319	$ 35,845
YouTube ads	3,812	7,002
Google Network	4,736	7,597
Google advertising	29,867	50,444
Google other	5,124	6,623
Google Services total	34,991	57,067
Google Cloud	3,007	4,628
Other Bets	148	192
Hedging gains (losses)	151	(7)
Total revenues	$ 38,297	$ 61,880

Appendix 3. Cloud Revenue by Year (Mlitz, 2021)



Appendix 4. Market Demands by Organization Maturity Level (Flexera, 2021)

Cloud Challenges by Maturity

BEGINNER	INTERMEDIATE	ADVANCED
1. Governance (79%)	1. Lack of resources/expertise (87%)	1. Managing cloud spend (81%)
2. Lack of resources/expertise (78%)	2. Security (86%)	2. Security (81%)
3. Cloud migration (77%)	3. Managing cloud spend (78%)	3. Governance (75%)
4. Security (76%)	4. Governance (77%)	4. Compliance (75%)
5. Managing cloud spend (75%)	5. Managing BYOL (77%)	5. Lack of resources/expertise (72%)

N=750 *Source: Flexera 2021 State of the Cloud Report*

Appendix 5. NPV Model

Google Hyperscale Data Center

Summary

Net Present Value ($M)	theNPV	1,037
Internal Rate of Return (%)	calcIRR	53.0%

Inputs

Description	Name	In Use	Index *Change this column*	Low	Base	High	Notes
Sales inputs							
Revenue at Full Capacity ($ millions)	RevenuebyCapacity	712	2		712		
Capacity Used	Capacity	0.8	2	50%	80%	100%	
Gross margin (% of sales)	pctGrossMargin	60%	2		60%		
Investment inputs							
Research & development ($ millions)	inv_RD	0	2		0		
Capital expenditures ($ millions)	inv_CapEx	600	2		600		
Working capital ($ millions)	inv_WC	52	2		51.6		
Financial and other model inputs							
Discount rate	pctDiscRate	11%	2		11%		Risk-free rate + Beta x 6% Prem = 6% + 0.84 x 6%
Inflation rate	pctInflRate	2%	2		2%		
Tax rate	pctTaxRate	20.1%	2		20.1%		
Depreciation life (years)	deprLifeYrs	8	2		8		
First year	yrFirst	2022	2		2022		
Last year	yrLast	2031	2		2031		

Time-series inputs

Year	theYear	2022	2023	2024	2025	2026	2027	2028	2029	2030
Investments as a % of total (backed into from Ex. 10)										
Capital expenditures	tsInp_pctInv_CapEx	100%	0%	0%	0%	0%	0%	0%	0%	0%

Calculations		**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Annual investments										
Capital expenditures - building ($ millions)	Calc_Inv_CapEx_Build	400	-	-	-	-	-	-	-	-
Capital expenditures - software/hardware ($ millions)	Calc_Inv_CapEx_Hard	200	-	-	-	200	-	-	200	-
Working Capital	Calc_Inv_WC	-	52	52	52	52	52	52	52	52
Total	Calc_Inv_Total	400	52	52	52	52	52	52	52	52
Cumulative investments										
Capital expenditures - building ($ millions)	Calc_CumInv_CapEx	400	400	400	400	400	400	400	400	400
Capital expenditures - software/hardware ($ millions)	Calc_CumInv_CapEx_Hard	-	-	-	-	200	200	200	400	400
Working Capital ($ millions)	Calc_CumInv_WC	-	52	103	155	206	258	310	361	413
Total	Calc_CumInv_Total	400		503	555	806	858	910	1,161	1,213
Revenue										
Revenue ($ millions)	Calc_Rev	-	570	570	570	570	570	570	570	570
Discount factor	Calc_DiscFact	90%	81%	73%	66%	59%	53%	48%	43%	39%

Cash flows ($M)		**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Revenue	CF_Rev	-	570	570	570	570	570	570	570	920
Gross profit	CF_GM	-	342	342	342	342	342	342	342	552
Depreciation	CF_Exp_Depr	-	(56)	(56)	(56)	(56)	(56)	(56)	(56)	(56)
EBIT	CF_EBIT	-	286	286	286	286	286	286	286	496
Taxes	CF_Taxes	-	-57	-57	-57	-57	-57	-57	-57	-100
EBIAT	CF_NOPAT	0	228	228	228	228	228	228	228	396
Less: Capital expenditures	CF_CapEx	(400)	-	-	(200)	-	-	(200)	-	-
Plus: Depreciation	CF_Exp_Depr	-	(56)	(56)	(56)	(56)	(56)	(56)	(56)	(56)
Less: Change in Working Capital	CF_IncWC	-	(52)	(52)	(52)	(52)	(52)	(52)	(52)	(52)
Free Cash Flow (FCF)	CF_FreeCF	(400)	233	233	33	233	233	33	233	401
Terminal value	CF_TermVal	-	-	-	-	-	-	-	-	1,230
Total FCF	CF_TotalFCF	(400)	233	233	33	233	233	33	233	1,630
Discounted FCF	CF_DiscFCF	(360)	189	170	22	138	124	16	101	637
Net Present Value	CF_NPV	1,037								

Appendix 6. Google Data Center Global Locations (Google, 2021)

Appendix 7. Cloud Vender by Revenue (Mlitz, 2021)