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Lumen Technologies  
Stryker Corporation  
Unity Technologies

Winter 2021 Equity Report





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# Lumen Technologies (NYSE: LUMN)

Lumen Technologies, Inc   NYSE: LUMN	
Negative	Neutral
Share price, 03/11/21:	\$13.60
Market capitalization:	\$14.676B
Shares outstanding:	1,079.13m
52-week range:	\$15.36 / \$8.62
EPS (TTM):	-\$1.14
Beta	1.1
Price target:	\$12.73

## Investment Overview

Our Analysis of Lumen Technologies (NYSE: LUMN) suggests a hold on the stock. Lumen's plans for future innovation position the company as a key player in the Fourth Industrial Revolution, a growing trend in smart manufacturing. Additionally, their future plans for growth are not contingent on the expansion of 5G, which has no clear rollout date, allowing for stable growth when compared to many of its competitors. However, despite a solid foundation for the future, Lumen's financials are weak as a result of multiple M&As in which the company impaired nearly \$12B in goodwill over the past 3 years. Ultimately, our DCF has produced an implied downside of 6.39% and a target share price of \$12.73, assuming a WACC of 4.80% and a terminal growth of 2.00%.

## Price Chart



## Company Overview

Lumen Technologies, formerly known as CenturyLink, is a telecommunications company that offers an enterprise technology platform consisting of network services, communications, security, cloud solutions, voice, and managed services. As an international facilities-based communications company, Lumen primarily provides a broad range of integrated services to businesses and residential customers in over sixty countries throughout North America, Europe, Latin America, and the Asia Pacific with approximately 200 global enterprise customers and 4.5 million consumer broadband subscribers.

Their product lines are split into two main categories: 1. Enterprises and 2. Small Businesses and Homes. For small businesses and homes, Lumen offers CenturyLink, an internet service, similar to Xfinity, Verizon, or AT&T, that allows customers to connect to data centers for their everyday computer use. However, Enterprise customers will require faster and more secure connections that can process and store substantially greater amounts of data. To that end, Lumen offers edge-computing services on private, bare-metal servers.

## Financial Highlights

(Dollars in millions)	2018	2019	2020
Revenue	22,580	21,458	20,712
% Growth	27.9%	-4.97%	-3.48%
EBIT	780	897	410
Debt to Assets	0.51	0.54	0.54
Goodwill Impaired	\$2,746	\$6,506	\$2,642

Recently, Lumen has been shifting its foremost focus onto expanding its enterprise segment. Beginning in 2017 and through the past 3 years, Lumen has invested heavily in a major M&A undertaking to amass large networks of fiber in preparation for their enterprise segment expansion. They have also focused on R&D into new technologies like edge computing and bare metal servers that offer faster and more secure connections meant to embrace emerging high-tech enterprise. As a result, since 2017, Lumen's enterprise segment now comprises a substantially larger portion of their total revenue. As shown below, whereas their enterprise segment was only responsible for 32% of their revenue in 2017, in 2020, it was responsible for 45% of Lumen's revenue.

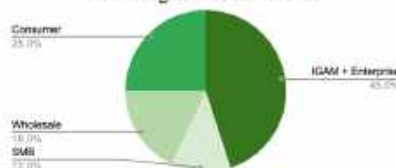
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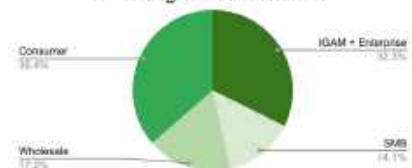
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2020: Segment % of Revenue



2017: Segment % of Revenue





### Revenue Model:

Lumen generally markets its enterprise services to IT departments or other customers with deep technological experience, offering both stand-alone services and bundled services designed to provide a package of integrated services. The company primarily obtains its revenue from contracts with customers. For access services, Lumen typically bills customers monthly charges a month in advance, and for usage and ancillary services, Lumen bills in arrears. Some of these contracts also include sale of equipment, but this is insignificant to the business as a whole. In addition, Lumen earns revenue from leasing arrangements, which are primarily fiber capacity agreements, as well as from government subsidy payments. Periodically, Lumen sells optical capacity on their network structured as indefeasible rights of use (IRUs), which typically last from 10 to 20 years and grant the exclusive right to use a specified amount of capacity or fiber.

### Mergers and Acquisitions:

Since Lumen's incorporation in 1968, the company has mainly grown through mergers and acquisitions to provide enhanced services to businesses and residential customers through an adaptive fiber network with high bandwidth, low latency, and a secure platform.

- **Embarq Corporation (2009):** Primarily a landline phone company and one of the largest independent local exchange carriers in the United States, bolstering Lumen's telephone and satellite network.
- **Qwest Communications International, Inc. (2011):** Leading telecommunications carrier in the Midwest and on the West Coast, adding fiber-optic network and providing Internet backbone data services and digital television.
- **Level 3 Communications, Inc. (2017):** Third largest provider of fiber-optic internet, expanding Lumen's fiber-optic network especially in the Southwest.
- **Other Notable Fiber Asset Acquisitions:** Global Crossing, Racial, KMC telecom, TelCove, ICG communications, Looking Glass Networks, WilTel Communications, Broadwing, Genuity, and more.

Through its mergers and acquisitions, Lumen has amassed over 450,000 fiber miles, making it the single largest network of ultra-low-loss fiber. Most importantly, its acquisition of level 3, one of the largest providers of fiber-optic internet, provides Lumen with the necessary fiber framework to build its planned network of 150 edge nodes that will be able to provide high bandwidth, low-latency edge computing services to over 95% of all US enterprises.

### Conclusion:

After focusing on efficiently integrating its acquisitions into the company, Lumen began to focus on improving customer experience by strengthening its products and services before also launching its new brand to signal its heightened focus on a delivering reliable, secure, and fast fiber platform. Going forward, Lumen plans to expand and improve its platform and use those enhancements to drive growth. Lumen has also indicated that it is planning to invest in and focus on the growth of its small and medium businesses segment.

## Industry Overview

Lumen Technologies is part of the telecommunications industry, which includes alternative carriers that provide communication and data transmission through high bandwidth and fiber optic cable networks in addition to integrated telecommunications services and wireless communications. The global telecommunications sector was valued at around \$1.80 trillion in 2020 and is forecasted to grow to \$2.53 trillion in 2027. About  $\frac{2}{3}$  of the global telecommunication market share is commercial while the other  $\frac{1}{3}$  is residential. The residential segment is anticipated to expand at a CAGR of 6.3% from 2020 to 2027, expected to be driven primarily by the increasing reliance and use of smartphones. With the shift in customer inclination towards cloud-based technology and mobile devices, spending on wireless communications structures has increased, and there is also an increasing number of mobile subscribers and stronger demand for high-speed data connectivity. With the increasing online consumer base, companies are also utilizing more cloud-based services, and the industry is expected to grow in the future as quantum computing and 5G technologies are developed further and incorporated into the current telecommunications industry.

The telecommunications industry is highly competitive, characterized by rapid technological change and evolving market conditions. Competitors include larger telecommunications service providers, cable and satellite companies, wireless providers, technology companies, cloud companies, broadband providers, and more niche providers. Companies in the industry compete to provide more attractive offerings such as lower prices, more reliable networks, quicker expansion and development of network infrastructure, adaptation to customer demands, customer service, and more. With the intense competition, companies need to continuously invest in networks and develop their infrastructure and offerings. The communications industry has gone through significant consolidation over the past years, allowing certain businesses to have stronger brand names, more financial and business resources, a stronger customer base, and broader products and service offerings.

### Characteristics of Fiber-Optic Industry:

In the Fiber-Optic industry, companies rely on the size and latency of their fiber optic network in order to secure the renewal of contract subscriptions. As a result, many companies often aim to build and secure networks in specific geographic areas and by acquiring these smaller companies, it is possible to build a larger extensive network. Leasing sections of fiber optic networks is also very common as a secondary source of revenue generation. This means that this industry has very high barriers to entry because of the high economy of scale.

### The Fourth Industrial Revolution:

The fourth industrial revolution is characterized by several key technological solutions. Specifically, the popularization of the internet of things (IoT) as well as the trend towards smart manufacturing in the manufacturing industry are major components of the fourth industrial revolution. First, when we talk about the IoT, we mean technologies that are "becoming smart"—smart refrigerators, smart toothbrushes, Amazon Alexa, etc. are all examples of components of the IoT.

Secondly, to explain smart manufacturing, it is easier to describe what it does, and how it offers solutions to commonplace inefficiencies in manufacturing. In particular, smart manufacturing seeks to perfect machine adaptability, allowing for the mass production of one-of-a-kind, customizable products, without the need for creating new machines. Furthermore, smart manufacturing will incorporate advanced Human-Machine interaction (HMI) that greatly increases human safety by reducing the physical demand in smart factories. Some of the main technologies involved in smart manufacturing are: Augmented Reality, machine learning, and IoT.

In conclusion, as the 4th industrial revolution gains traction, the comms industry will play the lead supporting role as a service provider for network platforms that offer greater speeds, bandwidth, and security—in a phrase, edge-computing.

## Product (Technology) Overview

This product overview focuses on the platform Lumen offers for enterprises. In this overview, while we will explain each of their services individually, it is important to note that Lumen bundles these services together as a holistic platform environment for their customers.

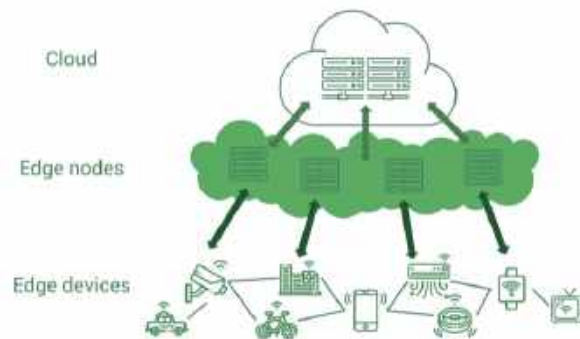
### Bare Metal-as-a-Service

The two industry standard methods of computing and data storage are hypervisor servers and bare-metal servers. Hypervisor servers are both more common and cheaper, working by connecting individual machines to one large server which operates through an operating system. The benefits to this type of computing are that it costs less to use and is more flexible, and this means that companies can easily increase the capacity of data they want to process. However, since these types of servers are shared between different companies, data is less secure, and it takes longer to run these calculations. A bare-metal server is a server which is “bare” because it lacks this hypervisor, or operating system. This means that each bare-metal server is dedicated to its consumer, which increases the cost, but makes computations much more efficient. Additionally, since these types of servers are private, data is more secure, breaches in a single company will not affect any other data.

### Edge Computing

One of the most useful applications of a bare-metal service is in a specific form of data processing called edge computing, where small bare metal servers called nodes are placed in higher volume around the country. To understand edge computing, it is helpful to visualize a data supply chain between an application on your phone and a data server. Let us say this application wants to use the camera on a phone and show 3D generated pictures of architecture in real time. In traditional cloud computing, the application would have to ask the camera for what it sees, send this data to a server, have that server run an operating system, and send back the results to the phone. This chain of events is still fast, however when a user is constantly moving their camera, having to send the data will cause the device to lag and slow results. Now, we can examine this same data chain except with the edge computing. The application will still ask the phone for the data from the camera, but this time instead of sending it to a single warehouse, the data will be sent to the closest node, and in this node, a specific bare metal server will process the data. Thus, when the application receives the data, it will get it much faster because the data had to travel less far and the computation occurred closer to input, or the “edge.”

### Edge Computing Visual



### Private/Hybrid Cloud

Lumen also offers private cloud servers for their customers. A private cloud provides a secure/impenetrable server wholly dedicated to a single organization to share files and documents. Furthermore, customers can choose to use a hybrid cloud, which connects them to both a hybrid cloud which offers the benefits of both the private and public cloud. In particular, Enterprises can choose to operate different services on the private cloud and public cloud, or they can use the public cloud as backup for their private cloud.

### Security

Aside from the inherent security advantages from bare-metal servers, Lumen offers several specific security solutions: 1. Web application firewall (WAF), 2. Bot Management and API protection services, and 3. Distributed denial of service (DDoS). These solutions aim to protect all levels of the edge computing infrastructure, specifically geared towards bolstering smart manufacturing.

# Investment Theses

## Edge Computing and the 4th Industrial Revolution

Lumen is well positioned to capitalize on the Fourth Industrial Revolution. Over the past several years, they have invested heavily to be a key player in edge computing. Outside of their own construction, Lumen has made strategic acquisitions of fiber companies such as Level3, Qwest, GlobalCrossing, Racal, and many more, amassing a total of 450,000 miles of fiber in their consolidated network, making them the largest network of ultra-low-loss fiber. Furthermore, through 2021, Lumen plans on completing the construction of their 150 edge node locations, which will provide access to the Lumen Edge Compute platform within at most 5 ms of latency to over 95% of US enterprises.

Each of their edge node locations are built directly on top of their fiber infrastructure and house bare metal servers unique to each of their customers. This serves several purposes. To explain bare metal servers, it is simple enough to glance inside the edge-node location, and we can see that each server is its own black box physically separated from the next. Using bare metal for edge computing is much more efficient and provides added security. Because bare metal servers are single-tenant environments, a customer can leverage all of the hardware architecture for its own computation, as opposed to a shared environment at a data center. Furthermore, a direct consequence of being a single-tenant environment connected to a hybrid cloud (access to both a private cloud and public cloud) is that bare metal servers are objectively the most secure networks, since the entire computation that occurs happens on a physically private server.

Smart manufacturing and efficient large scale IoT technologies are reliant on edge computing.

1. **IoT:** The amount of data generated by sensors, actuators, and other devices in the Internet of Things (IoT) has substantially increased in the last few years. IoT data are currently processed in the cloud, mostly through computing resources located in distant data centers. As a consequence, network bandwidth and communication latency become serious bottlenecks. Studies show that edge computing is necessary to meet the latency requirements of applications involving virtual and augmented reality.
2. **Data Analysis/Error-Tracing:** One of the key features of smart manufacturing is the ability to analyze large volumes of production data. On average, factories produce 1 TB of data, while only 1% of that data is analyzed and acted upon real time. Edge computing resolves the issue of data storage and the integration of IoT will catch manufacturing errors in real time.
3. **Machine Learning:** Will be fundamental to optimize the production processes, both for reducing lead times and reducing the energy consumption.

Ultimately, the Fourth Industrial Revolution poses a major growth opportunity for Lumen, especially because it is one that Lumen has been preparing for over the past several years. As smart factories become more commonplace, Lumen is uniquely positioned to provide the exact services necessary to support smart manufacturing. Lumen edge platform's broad availability for edge computing in bare-metal servers. Furthermore, aside from investing into the necessary infrastructure to support smart manufacturing, Lumen has already secured strategic partnerships to capitalize off the rising number of smart factories. One of its main partnerships is IBM, one of the leading players in Industry 4.0. Specifically, Lumen Technologies and IBM have integrated IBM Cloud Satellite with the Lumen edge platform to enable clients to harness hybrid cloud services in near real-time and build innovative solutions at the edge. Furthermore, as IBM partners with a growing number of smart factories, Lumen's technology and wide platforms for edge-computing will be integrated.

## Autonomy of 5G Rollout

Lumen has positioned itself within the industry to have a stable future growth regardless of the implementation of 5G wireless networks. Lumen's main focus is to expand edge computing, a process that does not depend on how widespread 5G technology becomes. Compared to many other competitors, which are relying on 5G to be a source of future growth in the industry, Lumen's growth is based on technology that they have already distributed. However, if 5G expands quickly, Lumen's edge computing infrastructure will benefit from the increased bandwidth and broadband speed and will be able to deliver computational power with even lower latency. Thus, Lumen's growth strategy is more resilient than its competitors, but is still able to take advantage of the emerging 5G market.

# Investment Risks

## Unhealthy Financials:

Lumen's goodwill is derived mainly from numerous acquisitions in which the purchase price exceeded the fair value of the net assets required. In their recent 10-K, goodwill and intangible assets were recorded at \$29.88 billion, which is just over 50% of Lumen's total assets, with \$18.87 billion being in Goodwill. This much goodwill on their balance sheet comes even after recording nearly \$12 billion in goodwill impairment over the past 3 years alone. As such, Lumen's goodwill impairment is consistently above the industry average, which may be a source of concern since impairment of these assets is critical due to its significance to the company and its segments. This high goodwill impairment suggests that Lumen has not been making good investment decisions, spending a lot more on acquisitions than what they were worth. This reduces Lumen's assets, and this can negatively impact equity.

As we will later reveal in our comparable analyses on other companies, Lumen has significantly higher debt-ratios than comparable companies, likely due to the fact that Lumen has invested heavily in supposedly overpriced acquisitions. In particular, Lumen has a total debt to total asset ratio of 54% in 2020, substantially higher than the median of 32% and average of 28% which we found among Lumen's comparables.

## Revenue in Non-Enterprise Segments

Despite naming the Small and Medium Business segment as a growth opportunity in their earnings call and financial reports, Lumen recorded a 5.4% decrease in EBITDA in that segment. This could indicate that Lumen's business strategy and investment decisions have not been very effective in growing the business segment so far, and this could suggest potential management issues as well. Additionally, Lumen depends on government funding for a portion of their revenue for their spending on infrastructure, and this could prove to be a problem as this funding comes with specific requirements and deadlines for certain projects. Lumen's access to CAF Phase II funding ends this year, and while the company is on track to meet the requirements, it cannot be sure that it will be able to meet the required buildout in a timely manner. However, Lumen has elected to receive an additional year of CAF Phase II funding in 2021. While the end of this funding was initially a concern, in early 2020, the FCC created the Rural Digital Opportunity Fund (RDOF) Phase I auction with \$9.2 billion in support payments over 10 years to deploy high speed broadband to over 5.2 million unserved locations, and Lumen won bids for \$26 million annually, which is expected to begin in 2022. Participation in CAF Phase II and RDOF programs brings financial risks since substantial penalties can be incurred if FCC measures are not met.



# Valuation

## Base Case Assumptions

- Revenue: -3.00% growth this year, +3.50% growth over the next 4 years
  - The decrease in revenue in 2021 represents the capital needed to finish construction in the planned 150 edge node network. We predict a growth of 3.50% starting in FY 2022 because we predict smart manufacturing contracts to increase towards the end of FY 2021 and this will carry through the next 4 years.
- EBIT margin- 3.50% continuous over the next 5 years
- D&A- 22.6% over the next 3 years, drops to 20% in 2024, and 18% in 2025
  - D&A will stay consistent from the historicals over the next 3 FY as Lumen develops and fixes its edge nodes, however we predict D&A to decrease in FY 2024 and FY 2025 because as edge computing becomes more standard, these updates to the network will decrease.
- CapEX- 17% continuous over the next 5 years
  - CapEx value converges to the final D&A value which illustrates the stable growth after FY 2025.
- Change in Net Working Capital- -1% continuous over the next 5 years
  - Lumen is planning to deleverage as well as refinance a large amount of debt over the next 5 years in order to help offload debt acquired in their previous acquisitions.

## Historical Data

Historical Values					
	2016	2017	2018	2019	2020
Revenue	\$17,470.00	\$17,656.00	\$22,580.00	\$21,458.00	\$20,712.00
Growth	-2.40%	1.06%	27.89%	-4.97%	-3.48%
EBIT	2,333.00	2,009.00	570.00	(2,726.00)	962.00
Margin	13.35%	11.38%	2.52%	-12.70%	4.64%
D&A	3,916.00	3,963.00	5,120.00	4,829.00	4,710.00
Margin	22.42%	22.45%	22.67%	22.50%	22.74%
CapEx	2,981.00	3,106.00	3,175.00	3,628.00	3,729.00
Margin	17.06%	17.59%	14.06%	16.91%	18.00%
Net Working Capital	1,094.00	(771.00)	(1,547.00)	(4,958.00)	(1,437.00)
Change in NWC	1,671.00	(1,865.00)	(776.00)	(3,411.00)	3,521.00
Margin	9.56%	-10.56%	-3.44%	-15.90%	17.00%

## Wacc Calculations

Tax Rate	Growth Rate
11.00%	2.00%
<b>Total Debt</b>	\$32,216.00
<b>Market Cap</b>	\$14,676.17
Beta	1.10
Market Return	6.08%
Equity Risk Premium	4.63%
Cost of Equity	0.07
Cost of Debt	0.05
% of Debt	68.70%
% of Equity	31.30%
<b>WACC</b>	4.80%

## Predicted Values- Base Case

Projected Values						
	2021	2022	2023	2024	2025	Perpetuity
<b>Revenue</b>	\$20,090.64	\$20,793.81	\$21,521.60	\$22,274.85	\$23,054.47	
Growth	-3.00%	3.50%	3.50%	3.50%	3.50%	
<b>EBIT</b>	703.17	727.78	753.26	779.62	806.91	
Margin	3.50%	3.50%	3.50%	3.50%	3.50%	
<b>D&amp;A</b>	4,540.48	4,699.40	4,863.88	4,454.97	4,265.08	
Margin	22.60%	22.60%	22.60%	20.00%	18.50%	
<b>CapEx</b>	3,415.41	3,534.95	3,658.67	3,786.72	3,919.26	
Margin	17.00%	17.00%	17.00%	17.00%	17.00%	
<b>Change in NWC</b>	-200.91	-207.94	-215.22	-222.75	-230.54	
Margin	-1.00%	-1.00%	-1.00%	-1.00%	-1.00%	
<b>Free Cash Flow</b>	\$1,951.81	\$2,020.12	\$2,090.82	\$1,584.86	\$1,294.51	
<b>Discounted Cash Flow</b>	\$1,862.42	\$1,839.33	\$1,816.53	\$1,313.88	\$1,024.03	\$37,312.77
<b>Short-Term Debt</b>		\$2,427.00		<b>Enterprise Value</b>	\$45,168.96	
<b>Long Term Debt</b>		\$29,410.00		<b>Equity Value</b>	\$13,737.96	
<b>Cash/Equivalents</b>		\$406.00		<b>Share Value</b>	<b>\$12.73</b>	
<b>Net Debt</b>		\$31,431.00		<b>Upside/Downside</b>	<b>-6.39%</b>	

## Bear Case Assumptions

The Bear Case assumes that Lumen is unable to generate enough revenue from their SMB and Consumer segment and as a result, the company will take a longer time to capture revenue from the edge computing sector. Furthermore, the fall in the EBIT margin represents issues Lumen may have with production of edge nodes as there are cybersecurity risks which may increase the amount of spending needed to implement the edge nodes.

## Predicted Values- Bear Case

Projected Values						
	2021	2022	2023	2024	2025	Perpetuity
<b>Revenue</b>	\$20,090.64	\$19,889.73	\$20,088.63	\$20,289.52	\$20,695.31	
Growth	-3.00%	-1.00%	1.00%	1.00%	2.00%	
<b>EBIT</b>	\$602.72	\$596.69	\$602.66	\$710.13	\$724.34	
Margin	3.00%	3.00%	3.00%	3.50%	3.50%	
<b>D&amp;A</b>	\$4,540.48	\$4,495.08	\$4,540.03	\$4,057.90	\$3,828.63	
Margin	22.60%	22.60%	22.60%	20.00%	18.50%	
<b>CapEx</b>	\$3,415.41	\$3,381.25	\$3,415.07	\$3,449.22	\$3,518.20	
Margin	17.00%	17.00%	17.00%	17.00%	17.00%	
<b>Change in NWC</b>	(\$200.91)	(\$198.90)	(\$200.89)	(\$202.90)	(\$206.95)	
Margin	-1.00%	-1.00%	-1.00%	-1.00%	-1.00%	
<b>Free Cash Flow</b>	\$1,862.40	\$1,843.78	\$1,862.22	\$1,443.60	\$1,162.04	
<b>Discounted Cash Flow</b>	\$1,777.18	\$1,678.90	\$1,618.10	\$1,196.96	\$919.42	\$33,549.64
<b>Short-Term Debt</b>		\$2,427.00		<b>Enterprise Value</b>	\$40,740.20	
<b>Long Term Debt</b>		\$29,410.00		<b>Equity Value</b>	\$9,309.20	
<b>Cash/Equivalents</b>		\$406.00		<b>Share Value</b>	<b>\$8.69</b>	
<b>Net Debt</b>		\$31,431.00		<b>Upside/Downside</b>	<b>-36.10%</b>	

## Bull Case Assumptions

The Bull Case assumes that Lumen is not only able to properly implement the edge computing network, but use the advances of 5G to further increase value capture from smart manufacturing. If 5G becomes a more widely accessible technology, it will increase the efficiency of smart manufacturing and will allow this technology to scale more. The increase in EBIT margin represents a smooth production of the edge node network and that this edge node system will finish earlier than intended.

## Predicted Values- Bull Case

Projected Values						
	2021	2022	2023	2024	2025	Perpetuity
<b>Revenue</b>	\$20,090.64	\$20,793.81	\$21,521.60	\$22,597.68	\$24,179.51	
Growth	-3.00%	3.50%	3.50%	5.00%	7.00%	
<b>EBIT</b>	\$803.63	\$831.75	\$860.86	\$903.91	\$967.18	
Margin	4.00%	4.00%	4.00%	4.00%	4.00%	
<b>D&amp;A</b>	\$4,540.48	\$4,699.40	\$4,863.88	\$4,519.54	\$4,473.21	
Margin	22.60%	22.60%	22.60%	20.00%	18.50%	
<b>CapEx</b>	\$3,415.41	\$3,534.95	\$3,658.67	\$3,841.60	\$4,110.52	
Margin	17.00%	17.00%	17.00%	17.00%	17.00%	
<b>Change in NWC</b>	(\$200.91)	(\$207.94)	(\$215.22)	(\$225.98)	(\$241.80)	
Margin	-1.00%	-1.00%	-1.00%	-1.00%	-1.00%	
<b>Free Cash Flow</b>	\$2,041.21	\$2,112.65	\$2,186.59	\$1,708.38	\$1,465.28	
<b>Discounted Cash Flow</b>	\$1,947.81	\$1,923.73	\$1,899.95	\$1,416.51	\$1,159.34	\$42,304.48
	<b>Short-Term Debt</b>	\$2,427.00		<b>Enterprise Value</b>	\$50,651.82	
	<b>Long Term Debt</b>	\$29,410.00		<b>Equity Value</b>	\$19,220.82	
	<b>Cash/Equivalents</b>	\$406.00		<b>Share Value</b>	<b>\$17.94</b>	
	<b>Net Debt</b>	\$31,431.00		<b>Upside/Downside</b>	<b>31.94%</b>	

## Comparables

- We included a variety of telecom companies into our comparable analysis
  - o LLNW- notably a smaller company however the company operates in a similar niche, focusing on edge computing like Lumen
- Lumen's debt ratio is notable as it is much higher than the industry average which coincides with the stated risk that Lumen's acquisitions were unique in increasing their debt.
- Median values were used because of potential outliers
- Exit multiple of 10x for the EV/EBITDA which was based on the median value of the comparable companies and follows the NYU Stern Damodaran estimated exit multiple

Companies	Debt Ratios		Revenue Growth	EV/Revenue	EV/EBITDA	P/E	
	Total Debt/Total Assets	Net Debt/EBITDA	(YoY)	2020	2020	Trailing	Forward
Cisco (CSCO)	0.15	0.17	-5.02%	3.57	10.54	19.04	14.27
AT&T (T)	0.34	2.77	-5.21%	2.18	7.14	19.23	9.09
Verizon (VZ)	0.46	2.37	-2.71%	2.81	7.99	13.02	11.14
Limelight Networks (LLNW)	0.07	6.39	14.73%	1.72	46.82	N/A	59.88
Vmware (VMW)	0.2	0.08	20.47%	5.55	16.46	36.76	19.65
IBM	0.43	3.8	-4.57%	2.16	12.49	19.4	10.78
HPE	0.32	1.94	-7.39%	1.13	5.05	11.64	8.77
Maximum	0.46	6.39	0.2	5.55	46.82	36.76	59.88
Median	0.32	2.37	-0.05	2.18	10.54	19.14	11.14
Minimum	0.07	0.08	-0.07	1.13	5.05	11.64	8.77
Average	0.28	2.5	0.01	2.73	15.21	19.85	19.08
<b>Lumen (LUMN)</b>	<b>0.54</b>	<b>5.54</b>	<b>-7.54%</b>	<b>2.25</b>	<b>8.21</b>	<b>10.49</b>	<b>8.6</b>



## Share Price from Comparables

	Minimum	Median	Maximum	Average
Enterprise Value (EV/Revenue) (1)	\$23,389.47	\$45,163.40	\$114,968.75	\$56,581.53
Enterprise Value (EV/EBITDA) (2)	\$28,627.77	\$59,774.57	\$265,547.56	\$86,284.54

1

EV/Revenue	Using Median
Enterprise Value	\$45,163.40
Net Debt	\$31,431.00
Equity Value	\$13,732.40
<b>Implied Share Price</b>	<b>\$12.82</b>

2

EV/EBITDA	Using Median
Enterprise Value	\$59,774.57
Net Debt	\$31,431.00
Equity Value	\$28,343.57
<b>Implied Share Price</b>	<b>\$26.45</b>

EV/Revenue	Using Average
Enterprise Value	\$56,581.53
Net Debt	\$31,431.00
Equity Value	\$25,150.53
<b>Implied Share Price</b>	<b>\$23.47</b>

EV/EBITDA	Using Average
Enterprise Value	\$86,284.54
Net Debt	\$31,431.00
Equity Value	\$54,853.54
<b>Implied Share Price</b>	<b>\$51.20</b>

## Exit Multiple

<b>Exit Multiple</b>	
EV/EBITDA	10x
Enterprise Value	\$50,719.84
Equity Value	\$19,288.84
Share Value	\$17.87
<b>Implied Upside</b>	<b>31.43%</b>



# Stryker Corporation

Stryker Corporation   NYSE: SYK	
Negative	Positive
Share price, 03/18/21:	\$230.86
Market capitalization:	\$86,850mm
Shares outstanding:	376.2mm
52-week range:	\$250.02 / \$124.54
EPS (FY20):	\$4.20
Beta	0.97
Average analyst opinion:	\$254.91
Price target:	\$307.80

## Investment Overview

With a targeted share price at \$307.80, we are recommending a **BUY** rating for Stryker Corporation (NYSE: SYK) because of its high level of growth potential in the ever-expanding market of medical technology. Due to Stryker's diversified revenue model consisting of contracts with both hospitals and third-party medical devices distributors, the business consistently maintains strong positions in its target markets. Additionally, the delay of specialized medical procedures due to the coronavirus pandemic paired with the United States' aging population are the main industry trends that Stryker can capitalize on to continue approximately 10% year-over-year growth. Finally, because of Stryker's high switching costs for specialized medical devices and their aggressive acquisitions that are well integrated into their diverse product portfolio, it is evident that Stryker is a uniquely positioned player that consistently differentiates itself from its competitors.

## Price Chart



## Company and Industry Overview

### Company Overview

Stryker Corporation is a medical technology company that was founded in 1941. Based in Michigan, Stryker specifically focuses on the manufacturing of various medical equipment and supplies, including surgical equipment, emergency medical equipment, implants for surgeries (mainly joint replacements), spinal devices, and a multitude of others. Since its inception, Stryker has expanded its manufacturing facilities to several locations within the United States, such as California, Texas, Florida, and others. The company reports revenues from a variety of segments; the main revenue drivers for the company come from selling to wholesalers for medical equipment or selling to hospitals and other medical establishments directly. Regarding the segmentation of the company, it is divided into three main categories: MedSurg (medical and surgical equipment), Orthopaedics, and Neurotechnology & Spine. Stryker's MedSurg segment mainly focuses on consumables -- products such as scalable patient beds, lights used during surgery, skin closure adhesives, syringes, personal protection equipment, and more. As for the Orthopaedics and Neurotechnology & Spine segments, the products that are offered here are far more technical than MedSurg. Some examples of products in these segments include proprietary dissection needles, external fixation devices for fractures, robotic-arm assisted surgery devices, nailing and locking systems for severe fractures/joint replacements, and far more. Since Stryker operates in both the consumables area and with products that are far more expensive and complex, it is safe to say that they possess a diversified product portfolio to satisfy all medical needs that any hospital may endeavor to satisfy.

## Financial Highlights

(Dollars in millions)	2018	2019	2020
Revenue	13601	14884	14351
% Growth	9.3%	9.4%	-3.6%
EBITDA	2537	2713	2223
EBIT	2356	2562	1954
% Margin	18.7%	18.2%	15.5%

### Recent Acquisitions

Stryker has also made several strategic mergers and acquisitions over the past couple of years to penetrate other industries and strengthen the weaknesses in their product line. For example, in 2017, Stryker acquired an imaging technology company that uses fluorescence called NOVADAQ. More recently, Stryker acquired a manufacturer of spine devices and instruments called K2M Holdings Group in 2018. Finally, Stryker acquired a leader in medical device manufacturing for extremities—Wright Medical—along with a sensor technology company named OrthoSensor. Both of these acquisitions were made at the end of 2020. Stryker has also had strong financial performance in recent years, mainly due to an increase in demand for trauma products globally. The company has had 19% CAGR in sales over a 32-year period and is projected to continue growing after the issue of the COVID-19 pandemic is resolved. Stryker's annual revenue for 2020 was \$14.351B, which is a 3.58% decline from 2019, but this is (once again) due to decreased demand from specialized medical offices. Its TTM EBIT for the end of 2020 is \$2.22B, making its EBIT margin 15.49%.

### Research Analysts

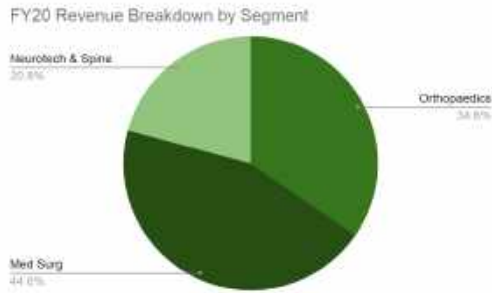
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**Exhibit 1: Stryker Revenue Distribution**



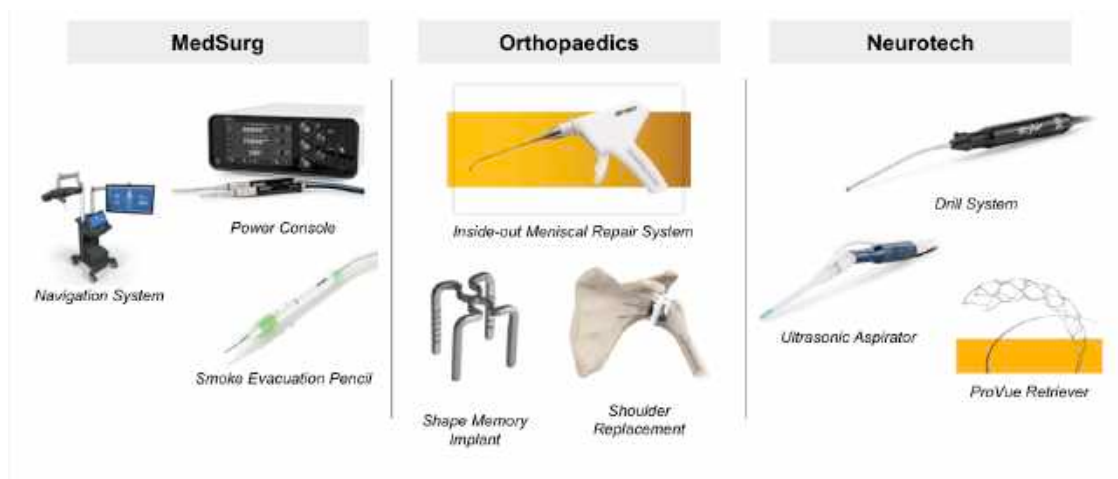
**Industry Overview**

Stryker Corporation operates in a multitude of industries. One of these industries, of which Stryker is the incumbent in the market, is the Medical Equipment and Supplies Manufacturing industry. Specifically, this industry specializes in the production of consumables and products that are needed frequently by hospitals and medical offices. Some significant statistics for the industry include \$83.7B in revenue and a 5.5% average profit margin. The industry is relatively saturated compared to some other sub-sectors of the healthcare sector, such as hospitals, as it comprises upwards of 15,000 businesses. Stryker has captured 8.6% percent of the total market share, with its main competitor being Johnson & Johnson with 6.7% of market share captured. Other significant competitors include companies like Baxter International, Boston Scientific Corporation, Abbott Laboratories, and more -- yet these corporations have not captured nearly as much market share as Stryker. The remaining 84.7% is saturated with a multitude of smaller, local companies, alluding to its lack of capital intensity.

Stryker is also heavily involved in the market of the production of specialized equipment that serve as more long-term, innovative solutions. Specifically, Stryker is additionally a major player in the specialized industry of Orthopedic Products Manufacturing. This industry provides one-of-a-kind products to support muscles, bones, and joints. The total revenue for the industry is \$8.7B and there are 455 businesses in all, so this industry is much less saturated with small players than the aforementioned one. Stryker has managed to capture an astounding 33.5% of this market, with the other major players being Zimmer Holdings Inc. with 27.7% of the market captured and Johnson & Johnson with 22.8% of the market captured. Other companies in the field include the likes of Smith & Nephew PLC. To highlight some of these companies in more depth, we can start with Johnson & Johnson: Johnson & Johnson's medical equipment segment has seen consecutive declines in sales of its medical equipment segment since 2017, and the main growth drivers have been its Interventional Solutions (prevention and diagnosis) and Vision (contact lens, etc.) although surgery and orthopedics account for a larger percentage of sales. As for another competitor, Becton, Dickinson and Co, we see that BD's medical equipment portfolio emphasizes diagnostic and drug delivery systems rather than surgical equipment and does not cover orthopedics/neurotech. BD's orthopedic equipment, for example, has very low technology integration.

Compared to its competitors in both the Medical Equipment and Supplies Manufacturing industry and the Orthopedic Products Manufacturing industry, Stryker's diverse product portfolio and continued innovation allows them to remain competitive and powerful in the market. In both of these industries, the reason why Stryker can maintain a competitive advantage is because of high barriers to entry; strict government regulations from the FDA and high research & development costs (at least for the latter industry) prevent new competitors from becoming industry leaders. To further expand on these barriers to entry, the reason why Stryker can additionally maintain a competitive advantage is due to the relationship that is required between device manufacturers and medical workers (physicians in particular). Specifically, according to the Medicare Payment Advisory Commission's report on the medical devices industry, these relationships can include royalty payments for products, funding for physicians to conduct research and implement educational programs, consulting fees for physicians, and more. Due to the fact that Stryker has already established these relationships with medical workers all around the world, they are able to maintain their position in the market while simultaneously mitigating the threat of new entrants.

**Exhibit 2: Stryker Product Portfolio Overview**





# Investment Thesis

## High switching costs driven by innovation in product customization and integration

Although products such as joint replacements naturally have high switching costs, which serves as an advantage for all medical equipment companies that manufacture and sell such products, Stryker has one other layer of product differentiation -- its systemic approach that integrates and customizes surgical operation. For example, its Consolidated Operating Room Equipment (CORE) 2 Console and Sonopet iQ Ultrasonic Aspirator System both provide surgeons with a single control center where they can control and customize connected tools with various functions. These consoles constitute the core of its drills and power tools portfolio, while also offering universal compatibility with non-Stryker products. Hence, it is clear to see that product customization and integration, mainly as a result of internal R&D, is a key factor to creating an ecosystem of products.

Further on the idea of high switching costs, Stryker capitalizes on the fact that they have captured a great deal of market share and have been in the surgical devices business since 1941. The defining quality of the medical devices industry, specifically regarding surgical devices, is the steep learning curve for utilizing certain products and systems (such as the aforementioned CORE 2 Console and the Sonopet iQ Ultrasonic Aspirator System). Most hospitals are reluctant to abandon their current products to avoid added training costs. There is also the added risk of accidents if a medical worker or a surgeon is not familiar with a new interface. According to a study written by doctors at the University of Pennsylvania called *Implant vendors and hospitals: Competing influences over product choice by orthopedic surgeons*, the preferences of surgeons rarely change since their residency training; hospitals, in general, tend to stick with the same vendors/sales representatives from anywhere between 5 to 15 years. Moreover, surgeon testimonies show that when purchasing new medical devices, hospitals and surgeons prefer the same vendors for cost-saving purposes. Hence, there is a certain degree of stickiness that is attributed to this industry on which Stryker has already capitalized. Additionally, according to analysts, Stryker remains one of their prime examples of a holder of an economic moat in the form of high switching costs for similar reasons; especially when it comes to orthopedic implants, a surgeon will effectively lose time and money in trying to learn the nuances of a competitor's product that they have never previously used while simultaneously sacrificing comfort.

## Growth driven by strategic acquisitions in an effort to create an end-to-end solution for surgical procedures

Several Stryker products, especially from the Orthopaedics sector, are highly compatible from a robotic workflow standpoint. Stryker's recent mergers and acquisitions are built around creating data-driven feedback mechanisms that allow Stryker products to be used long after a surgery occurs. For example, Stryker's recent acquisition of Mako SmartRobotics™ -- consisting of 3D scanning, precision cutting for surgeries via haptic technology, and data platforms to promote patient engagement -- fits in perfectly with a later acquisition that the company made by the name of OrthoSensor. OrthoSensor specifically focuses on remote patient monitoring wearables and a cloud-based data platform named OrthoLogIQ®. Due to the compatibility of the products that these two companies offer, a comprehensive product ecosystem is formed. The process of starting with Mako products for 3D modeling, then using a Stryker joint replacement product (coupled with surgery assisted by Mako), and finally ending with patient analytics from OrthoSensor is perfect example of the "end-to-end" model that Stryker is attempting to create via its acquisitions. Moreover, Stryker is a strong player in the traditional spine market, but has a relatively weaker position in the MIS (minimally invasive surgery) spine market. As a result, their total market share trails behind that of Medtronic, DePuy Synthes and NuVasive. To expand their presence in the MIS market, Stryker acquired K2M in the fourth quarter of 2018. K2M is a global leader of complex spine and minimally invasive solutions focused on achieving three-dimensional Total Body Balance. Stryker's strong portfolio nowadays, with acquisition of K2M and other companies such as Mobius Imaging and Cardan Robotics, allows them to reach a wider range of patients and master new manufacturing technologies.

Stryker's acquisitions leading to end-to-end integration doesn't end with their new Mako product line; this mission is further exemplified by the management's acquisition of Mobius Imaging and its sister company GYS Tech in 2019 for approximately \$500 million. While most companies of Stryker's size would consider a deal of this size as a simple tuck-in acquisition, it is clear to see that Stryker is working to incorporate the products that Mobius offers into other acquisitions that they have made in the past like Mako. One of the main products that Mobius Imaging offers is the Mobius Airo scanner, which is described as a diagnostic-quality CT imaging system. Analyst Ryan Zimmerman of BTIG states that this scanner, along with a technology from Mobius Imaging known as Cardan Robotics, would "position Mako well in an outpatient setting and offer a differentiated platform beyond robots today that primarily place pedicle screws." We can, therefore, see that many of the acquisitions with which the management chooses to engage mainly revolve around fitting in with previous acquisitions to create end-to-end solutions that make consumer purchase stickier. While the acquisition of Mobius was mainly to bolster the Spine segment, Stryker will continue to make further acquisitions to prioritize innovation in all of their segments.

Due to the aggressive acquisition agenda that Stryker currently has in place, it is equally important to analyze the leadership and the performance of these new and improved product portfolios. Stryker chairman and CEO Kevin Lobo has been extremely proactive during the COVID-19 pandemic. Not only has the company stocked supply and brought back furloughed employees as needed, but Lobo spearheaded another major M&A deal for an astounding \$4.7 billion -- Wright Medical, which Lobo described as an enhancement of the company's "global market position in trauma and extremities, providing significant opportunities to advance innovation and reach more patients." As a result, while most other companies in the medical technology sector are waiting for COVID-19 to pass over before making any large acquisitions or developments to their product line, Stryker is effectively using their cash on hand to get ahead of their competitors. In terms of some more specific statistics regarding Stryker's recent mergers and acquisitions, we observe that Stryker is markedly efficient with using their cash; more than 50% of Stryker's annual capital allocation is devoted to acquisitions. Stryker is a serial acquirer that complements internal R&D with external R&D from acquisitions. By making a large acquisition close to every other year and retaining cash for the remaining years (~\$2 billion in 2011, ~\$2.5 billion in 2013, ~4 billion in 2016, etc.), the company works to deeply integrate these new acquisitions into Stryker's existing product line. By not attempting to "save" one of their weak divisions, and instead working to bolster their existing ones, Stryker has managed to maintain consistent sales growth for the past four decades at the compounded rate of 16.2%.

# Investment Risks

## Non-essential procedures rebound may be slower than anticipated

The most immediate risk is the uncertainty around non-essential procedures volume. The decrease in the number of non-essential procedures is evident in the decline in sales in 2020. Although we anticipate the situation will return to normal as vaccine rollout continues, it is possible that the process might take much longer. Further, once non-essential operations become popular once again (mainly in the Orthopaedics and Neurotechnology & Spine segments), the MedSurg segment will be negatively impacted. Many of the products that the MedSurg segment has sold, especially recently, are consumables that have been used for COVID-19 purposes. Finally, due to the prevalence of telemedicine in today's day and age, there is always the chance for a decrease in revenue for consumables as more and more patients cease to go to medical offices in person.

## Price pressure on MedTech companies due to government regulations

Government regulations and new reimbursement models are increasing price pressure on the whole MedTech industry. Examples include value-based reimbursement, the government excise tax on medical devices, the FDA UDI initiative, and hospitals reducing spending on equipment due to perceived reduction in reimbursement under a value-based care model. It means that the need for cost efficiency would be intensified. Furthermore, there is also the issue of ensuring that Stryker can mitigate price pressure following their acquisition of Wright Medical. This transaction was valued at \$4.7 billion, making it one of the most expensive Stryker acquisitions to date. This was mainly to bolster their extremities and trauma segments on an international scale, which also brings the potential of further FDA regulation for international Wright Medical products that may not have been introduced in the United States yet. Hence, Stryker needs to ensure that they have proper global integration, albeit difficult during the pandemic, to ensure that products are implemented in a staggered manner depending on differing levels of regulation.

# Valuations

## DCF Assumptions

- Revenue:
  - Base: Rebound in 2021 while growth rate gradually slows down due to large sales quantity
  - Bear: Growth rate fails to return to pre-pandemic level and growth rate slows down due to large company volume
  - Bull: Growth rate surpasses pre-pandemic level and remains strong despite large company volume
- EBIT: Slight increase from 2020, maintaining pre-pandemic levels
- Capital Expenditures and D&A: Gradually increase/decrease to similar levels so that investment corresponds to depreciation
- Terminal growth rate: Set at 2% to reflect stable, yet low, growth rate in perpetuity

With these assumptions, we eventually came to a WACC of 4%. Our Gordon Growth method led us to an implied share price at \$307.80 in the base case, with an implied upside of 24.1%. In the bear case, we arrived at an implied share price of \$249.50, with an implied upside of 0.5%. In the bull case, we arrived at an implied share price of \$378.40, with an implied upside of 52.5%.

Historicals					
Year:	2016	2017	2018	2019	2020
Revenue Growth:	13.9%	9.9%	9.3%	9.4%	-3.6%
EBIT Margin:	19.2%	18.5%	18.7%	18.2%	15.5%
CapEx (% of rev):	4.3%	4.8%	4.2%	4.4%	3.4%
D&A (% of rev.)	4.8%	5.2%	5.3%	5.2%	5.7%
NWC	\$ 1,625.00	\$ 2,598.00	\$ 2,683.00	\$ 3,482.00	\$ 2,484.00
Change in NWC	\$ (205.00)	\$ 973.00	\$ 85.00	\$ 799.00	\$ (998.00)
Change in NWC (% of rev):	-1.81%	7.82%	0.62%	5.37%	-6.95%

Assumptions					
Terminal Growth Rate:	2.0%	EV/EBIT Exit Multiple:	19.1x	Terminal Shares Outstanding	375
Year:	2021	2022	2023	2024	2025
Revenue:	10.0%	8.0%	7.0%	7.0%	6.0%
EBIT Margin:	18.5%	18.5%	18.2%	18.0%	18.0%
CapEx (% of rev)	4.0%	4.2%	4.4%	4.6%	4.9%
D&A (% of rev)	5.7%	5.5%	5.3%	5.1%	4.9%
Changes in NWC (% of rev)	-2.0%	1.0%	2.0%	1.0%	1.0%
Tax Rate	26.1%	26.1%	26.1%	26.1%	26.1%

Exhibit 3: Stryker Historicals and Base Assumptions

WACC		Future Financial Statements (I.e Pro Forma Financials)					
Share Price:	\$ 248.15	Year:	2020	2021	2022	2023	2024
Shares Outstanding:	376.2	Revenue	\$ 15,786.10	\$ 17,364.71	\$ 18,753.89	\$ 20,066.66	\$ 21,471.32
Market Cap:	\$ 93,354.03	EBIT:	\$ 2,920.43	\$ 3,212.47	\$ 3,413.21	\$ 3,612.00	\$ 3,864.84
Debt:	\$ 21,246.00	CapEx	\$ 623.55	\$ 729.32	\$ 825.17	\$ 923.07	\$ 1,052.09
% of Debt:	18.5%	D&A	\$ 899.81	\$ 955.06	\$ 993.96	\$ 1,023.40	\$ 1,052.09
% of Equity:	81.5%	Change in NWC:	\$ (315.72)	\$ 173.65	\$ 375.08	\$ 200.67	\$ 214.71
Cost of Equity:	4.5%	<b>Cost of Equity</b>					
Cost of Debt:	2.3%	Beta:	0.44				
Implied WACC:	4.0%	Risk-free Rate:	1.4%				
		Rate of Market Return:	8.5%				
		Market Risk Premium:	4.8%				
		Implied Cost of Equity:	4.5%				
similar (although slightly lower) level of current assets, but much less short-term debt in FY2020							
<b>Free Cash Flows</b>							
FCF:	\$ 2,899.12	\$ 2,589.95	\$ 2,490.14	\$ 2,753.15	\$ 2,838.51		
Discounted FCF:	\$ 2,788.09	\$ 2,395.38	\$ 2,214.87	\$ 2,355.02	\$ 2,335.06		
Sum FCF:	\$ 2,788.09	\$ 5,183.47	\$ 7,398.34	\$ 9,753.36	\$ 12,088.41		
<b>Implied Terminal Values</b>							
Gordon Growth TV:	\$ 146,070.97	Exit Multiple TV:	\$ 73,818.42	Net Debt:	\$ 18,303.00		
Discount GG TV:	\$ 120,163.04	Discounted Exit Multiple TV:	\$ 60,725.58				
<b>Implied Fair Value</b>							
Enterprise Value:	\$ 132,251.45	-	\$ 72,814.00				
Implied Equity Value:	\$ 113,948.45	-	\$ 54,511.00	Avg:			
Implied Share Price:	\$ 303.86	-	\$ 145.36	\$ 224.61			
Implied Upside:	22.5%	-	-41.42%				

Exhibit 4: DCF Model: Base Case

Assumptions						
Terminal Growth Rate:	2.0%	EV/EBIT Exit Multiple:	19.1x	Terminal Shares Outstanding	375	
Year:	2021	2022	2023	2024	2025	
Revenue:	5.0%	5.0%	4.5%	4.0%	3.0%	
EBIT Margin:	18.5%	18.5%	18.2%	18.0%	18.0%	
CapEx (% of rev)	4.0%	4.2%	4.4%	4.6%	4.9%	
D&A (% of rev)	5.7%	5.5%	5.3%	5.1%	4.9%	
Changes in NWC (% of rev)	-2.0%	1.0%	2.0%	1.0%	1.0%	
Tax Rate	26.1%	26.1%	26.1%	26.1%	26.1%	
<b>Implied Fair Value</b>						
Enterprise Value:	\$ 111,851.22	-	\$ 61,870.67			
Implied Equity Value:	\$ 93,548.22	-	\$ 43,567.67	Avg:		
Implied Share Price:	\$ 249.46	-	\$ 116.18	\$ 182.82		
Implied Upside:	0.5%	-	-53.18%			

Exhibit 5: DCF Model: Bear Case

Assumptions						
Terminal Growth Rate:	2.0%	EV/EBIT Exit Multiple:	19.1x	Terminal Shares Outstanding	375	
Year:	2021	2022	2023	2024	2025	
Revenue:	14.0%	13.0%	12.0%	11.0%	10.0%	
EBIT Margin:	18.5%	18.5%	18.2%	18.0%	18.0%	
CapEx (% of rev)	4.0%	4.2%	4.4%	4.6%	4.9%	
D&A (% of rev)	5.7%	5.5%	5.3%	5.1%	4.9%	
Changes in NWC (% of rev)	-2.0%	1.0%	2.0%	1.0%	1.0%	
Tax Rate	26.1%	26.1%	26.1%	26.1%	26.1%	
<b>Implied Fair Value</b>						
Enterprise Value:	\$ 160,200.98	-	\$ 87,671.82			
Implied Equity Value:	\$ 141,897.98	-	\$ 69,368.82	Avg:		
Implied Share Price:	\$ 378.39	-	\$ 184.98	\$ 281.69		
Implied Upside:	52.5%	-	-25.45%			

Exhibit 6: DCF Model: Bull Case



## Comparables

By comparing Stryker with 8 medical device companies and the medical/surgical business segment of medical companies, we arrived at an industry-average EV/EBITDA ratio of 19.1, which led us to an implied share price of \$195.30 and a -23.2% implied downside.

Companies	EV/EBITDA
Zimmer Biomet Holdings Inc	14.6
Johnson & Johnson	19.3
Hill-Rom Holdings	14.1
Conmed Corp	17.6
Smith & Nephew Plc	10.1
Olympus Corporation	23.0
Medtronic	28.4
Becton Dickinson	25.7
Mean	19.1
Median	18.4
High	28.4
Low	10.1
SYK Implied EV (in millions \$)	94701
Implied Equity Value	73455
Shares Outstanding (in millions)	376.2
Implied Share Price	195.3
Implied Downside	-21.32%

**Exhibit 7:** Comparable Companies Analysis



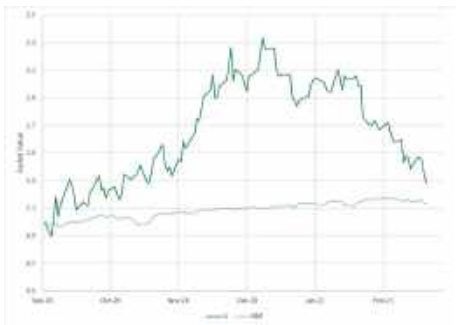
# Unity Technologies

## The future of the gaming industry

Texas Instruments Incorporated | NYSE: U

Negative	Neutral	Positive
Share price, 03/05/21:		\$93.82
Market capitalization:		\$25.66 B
Shares outstanding:		275.54mm
52-week range:		\$174.94 / \$65.11
EPS:		N/A
Beta:		N/A
Price target:		N/A

### Price Chart



### Financial Highlights

(Dollars in thousands)	2020	2019	2018
Revenue	772,445	541,779	380,755
% Growth	42.57%	39.01%	N/A
EBITDASMRD	421,652	7,667	6,774
R&D	403,515	225,982	N/A

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## Investment Thesis

Our analysis of Unity Software has presented a strong growth proposition and high investment potential despite the company's current negative-profit model. Unity's current dominance in the mobile gaming market is entrenched through their sticky developer ecosystem, that converts games developed on the Unity platform into long-term users of the firm's operation services. Additionally, Unity is the current market leader in the AR/VR gaming development space. Within continued high investment, the company is poised to grow significantly as the industry expands in the next decade. Finally, Unity's strong retention of users and large customers with an extremely low churn provides a platform for Unity's revenues to grow significantly as the mobile gaming market explodes in the Asia Pacific region.

## Investment Highlights

**Expansion of Sticky Ecosystem through Strategic Acquisitions.** Unity is actively expanding its product ecosystem to become the one-stop solution for customers. Its acquisitions have focused on smaller companies that have a specific expertise that can be integrated into Unity's product line, preventing a reliance on inorganic growth, and expanding the range of products and services it offers. By acquiring Vivox, a company specialized in in-game voice and text chat, Unity has highlighted its goal to expand from just game design, but to also game support and services. Through acquisitions such as Codice Software and Multiplay, Unity has expanded their role from a provider of design and game development software to include many cloud operations and hosting services to maintain and scale games. With the acquisitions of DeltaDNA and Applifier, Unity has expanded their breadth of services into analytics, messaging, ad campaign tools, and social gaming integration. Through these acquisitions coupled with the in-house development of products such as custom AR/VR design tools, Unity has managed to create an ecosystem that brings in customers and ensures they stay by becoming ingrained in the full lifecycle of a product, ranging from idea, to development, to hosting and monetization. Unity appeals to consumers by allowing them to seamlessly use the many services they offer without relying on different vendors that cause more work. Unity realizes the value in having all the parts of gaming and development software under one roof and aims to capitalize on this fact by being the one stop solution for all software and tools related to development.

With regards to management, John Riccitiello, the CEO of Unity, has emphasized his aversion to bolt on acquisitions that provide no additional value to the company. Instead, he prefers acquisitions that bring additional capabilities to the platform. According to Riccitiello's recent statement in Unity's February 4th earnings call, "acquisitions are used to get us something that we can't get another way cheaper or more effectively. But think of us as primarily organically oriented." As long as Unity continues to follow this approach to acquisitions, they will continue to benefit from an expanding platform that retains customers and continues growing organically.

The benefit of a large and cohesive product ecosystem is that it is inherently sticky as customers become increasingly reliant on the company's products. To start, game development is a time-consuming process that requires significant effort by trained developers. That in of itself creates a sticky product where game developers cannot simply switch the engine that runs the game. One of Unity's main selling points is its Multiplatform support where developers can build content once and have it deployed on over 20 other platforms with no additional work. Any developer that relies on this feature will have significant additional costs when switching to a different engine in order to run their software on the same platforms. Furthermore, when the remaining systems that are used to support, monetize, and host the game are all based on the same software, the cost to switch becomes very high. The high switching costs result from the inherent inefficiencies that accompany working with multiple different vendors and different technologies and the resulting training for developers.

# Investment Highlights

**Expansion of sticky ecosystem through strategic acquisitions, continued.** With a large ecosystem of products, Unity is able to cross-sell more. For example 55% of Unity's Create products are also customers of Operate. 64% of Operate Revenue that was from customers generating more than \$100,000 a year were from customers who also use Create solutions. In addition, a customer cohort analysis that tracks customer spending over time shows that customers that started in 2018 have continued more years with nearly a 266% increase based on a trailing period of 12 month. The company attributes this increase in spending to customers using additional services and cross-selling. For companies, having a single provider for all the necessary services improves production efficiency and reduces the number of trained specialists that are required. Unity has demonstrated its commitment to grow its product line both organically and through smaller acquisitions in order to create the ideal development ecosystem.

**Expansion into non-gaming and AR/VR markets.** Unity is increasingly being used for simulations, 3D design, and the creation of immersive experiences beyond gaming in industries such as film, medical, architecture, and more. For example, Unity recently collaborated with brands such as Toyota, Lexus, Audi, and Volkswagen to help create AR/VR content. They are at the forefront of technologies that are used outside of the gaming industry. One example of this is enabling ray tracing within graphics technologies at a rendering speed fast enough such that interactive content is photorealistic. This is already achievable in certain contexts but requires substantial processing power. Unity has demonstrated their capabilities in ray tracing for BMW, but also continues to support ray-tracing and other cutting-edge graphics with its release of the High Definition Pipeline in 2018, which offers developers more powerful graphics rendering for GPU devices. This will allow those devices to achieve high visual fidelity in PC and console devices, as well as non-gaming uses (such as industrial simulations and film). There are significant applications for Unity outside of the gaming industry and we expect Unity Technologies to grow significantly in these industries in the future because of their technological edge.

The AR and VR market is projected to grow substantially, and we believe that Unity is the best suited platform to take control of this market largely due to its strong management, current market positioning and commitment to staying as a market leader, as well as their cutting-edge technology. Tony Parisi, Unity's Global Head of VR/AR Brand Solutions has been working in the industry since the mid-1990s. He is an early pioneer in virtual reality- some of his accomplishments include co-creating the VRML and X3D file format (used for representing 3D interactive vector graphics), as well as specifications underlying WebGL (API for rendering interactive 2D and 3D graphics). We are confident in his abilities to ensure Unity is set up to succeed for developing a wide range of 3D applications for AR and VR.

Unity currently has a strong hold of the AR/VR market and powers more than 60% of all AR/VR content. They are used for the development of apps for all of the major players in the MR and VR market- they power 69% of the Oculus Rift experience, 74% on HTC Vive, 87% on Gear VR, and 91% of Mixed Reality (MR) experiences on HoloLens. Unity additionally serves as building blocks or integrates with most of the emerging AR/VR platforms, including Google's ARCore and Apple's ARKit.

Unity has made significant investments in the emerging AR/VR market, with the goal of creating a full-featured system for developers. Their technology continues to outperform competitors- one particular focus of Unity's Research Lab teams is on the next generation of authoring tools (tools that assist in creating digital content), particularly in the context of AR and VR headsets. One particular component of their vision is where nontechnical creators can develop 3D content solely through voice commands and hand gestures. Unity released an early concept video for this project in early 2016.

As the AR/VR market continues to grow, so does the competition- including Amazon Sumerian and other drag-and-drop interfaces that are searching to simplify the experience for less technical creators. Unity plans on staying ahead of the competition by pushing its two-pronged approach, led by its AI and AR/VR divisions.

**Sustained growth and retention within companies.** Unity demonstrates impressive growth numbers with retention of existing customers and potential growth to new ones. In terms of Unity's ability to preserve its existing customer base, the company posted a net expansion rate of 144% in September 2020 which increased from the net expansion rate of 132% in September 2019. This metric was obtained by measuring Unity's revenue from the same bucket of customers in their Create and Operate Solutions segments over time. Therefore, Unity posted 44% revenue growth year-over-year from the same group of existing customers. This can be mainly attributed to the cross-selling nature of Unity's two business segments, shown in growing subscriptions to Create Solutions and greater usage in Operate Solutions for existing customers.

Additionally, Unity operates in a strong market ecosystem with consumers that post impressive growth numbers to also boost Unity's revenues over time. For example, using the Customer Cohort Analysis, the cohort of new customers to Unity in 2018 grew in revenue contributions from \$21.4M in December 2018 to \$57.0M in December 2019. Thus, 2018's customer cohort possessed revenue growth year-over-year of 266%, demonstrating high expansion in the spending of Unity's pre existing customers. Additionally, the success of Unity's customers has increased, seen in the promising growth in the number of customers that generate more than \$100,000 revenue each, increasing from 515 customers in June 2019 to 716 in June 2020.

In terms of churn, the Create Solutions segment possesses a very low churn rate, since engineers and game creators need high levels of training before using the game engine. As such, Create Solutions has an expected CAGR (compounded annual growth rate) of 20% and the Operating Solutions segment comparatively has one of 40%. The low churn rates of Unity stem from the training necessary to use the app-building platform, where the game development lifespan can last for years and costs for switching are very high. Additionally, Unity may not capture as many

All together, the mobile gaming industry expects a CAGR of 12% from 2020 to 2025. With such promising industry growth and high stickiness in Unity's customer base, Unity illustrates high potential for growth and expansion of their market share.



# Company Overview

## Company History

Unity Software Inc. (NYSE: U), originally founded in Denmark in 2004 as Over the Edge Entertainment, is an American video game development company based in San Francisco that provides tools and technology solutions to video game developers. The company was launched with the mission of democratizing the gaming development process. Unity has become the most popular third-party game engine since releasing its first game development engine in 2004, and it has been used for developing over 50% of the top 1,000 PC, console, and mobile games available in the market.

Unity Technologies provides developers with Unity, a cross-platform game engine that allows them to quickly create 2D and 3D content. Game engines lay the software framework to build and create video games. These software development tools, though not necessary to create games, are designed to reduce complexity, cost, and time-to-market in video game development. Users of the game engine can import digital assets and add “logic” to guide asset’s behavior, physics, character’s interactions, and other features to create an interactive game. Game engines typically consist of the following components: a main game program and its game logic, a rendering engine used to generate 3D animated graphics, an audio engine (consisting of sound algorithms), an engine that implement “physical” laws within the system, and Artificial Intelligence for pathfinding. The final product is then exported to one or more of the 20 platforms Unity supports. Unity’s cross-platform capabilities, as well as its simple interface distinguishes it from other engines in the market.



Unity has a strong market position against competitors and is currently operating in a duopoly with Epic’s Unreal. In 2018, Unity had 45% of the market, while Unreal had 17%. Unity and Unreal ultimately cater to different core markets: Unity has prioritized easy use since its early development, while Unreal is oriented toward bigger, high-performance professionals. Unreal also requires more extensive programming and technical knowledge over Unity. Unity’s impact is far reaching: in 2019, games and other forms of content made using Unity were installed more than 33 billion times over the 12 month period, while the development platform reached 3 billion devices during that time. Unity also currently dominates in mobile games (with over 50% of market share), the largest and fastest growing segment of the gaming industry, and has over 60% of the market share in AR and VR content.

## Business Lines

Unity operates on a platform of two distinct segments: (1) Create Solutions, software for content creators that includes the main Unity core game engine, and (2) Operate Solutions, tools for managing and monetizing content on customer applications. Create Solutions consists mainly of subscription sales for Unity Pro and Unity Plus, giving access to software with cloud functionality and multi-platform support and lasting a term of around one to three years before likely renewal. The Create Solutions segment also includes the sales of professional services such as consulting, platform integration, customer training, and customized application development. Conversely, the Operate Solutions segment mainly offers an in-game advertising network that currently serves around 23 million ads per month. Called United Auction, this platform allows for publishers of games to find the highest bid from potential advertisers, though Unity does not currently take a cut of the revenue derived from in-app purchases (IAP). Also included in Operate Solutions, Live Services provide customers further abilities to develop and manage live games, also including video chat services. Overall, Create Solutions makes up 29% of Unity’s revenue, Operate Solutions 62%, and the remaining 9% comes from Strategic Partnerships & Others, which comes through tech brands partnering with Unity or the Unity Asset Store to buy and sell digital assets.

In terms of the monetization of the Create and Operate Solutions, Create Solutions derives revenue from subscriptions that exist on a free tier (called Personal) until a company reaches \$100K+ in revenues. After reaching this size, companies can choose between Unity Plus (\$399 per year) and Unity Pro (\$1,800 per year), as well as Enterprise (\$200 per month) which is intended for large teams. On the other hand, Operate Solutions makes money through mostly revenue-share models on ad-serving platforms (mainly Unified Auction) and usage-based models on cloud-based based platforms. Per business line, Create Solutions saw revenue growth numbers of 33% in December 2019, 23% in March 2020, and 39% in June 2020. Operate Solutions comparatively grew in revenue 53% in December 2019, 54% in March 2020, and 63% in June 2020, both demonstrating higher growth during the height of COVID-19.

## Recent Acquisitions

Unity recently completed its IPO as of September 17, 2020, raising a total of \$1.3 Billion at a \$13.6 Billion valuation. It started trading as a public company on the NYSE the following day. In December 2020, Unity announced the acquisition of the multilayer networking framework, MLAPI, and RestAR, a computer vision and deep learning company. The acquisition of MLAPI aligns with their efforts to expand the Unity ecosystem with an easy-to-setup and extend first-party multiplayer networking system for GameObjects that can scale to meet the needs of high-performance titles. The timing of the acquisition of RestAR aligns with Unity’s upcoming launch of Unity Forma, a tool that enables marketers to use 3D data to create and publish interactive experiences. RestAR will allow marketers to create a digital twin of any object or product in 3D.

# Industry Overview

## Fast Growth

Unity operates in the gaming industry, which has more than doubled in the past decade. The video games industry is expected to grow at a CAGR of over 8%, reaching revenue of over \$200 billion by 2023. The mobile gaming market, in particular, is predicted to outperform other platforms. The company estimates that the market for operating and creating solutions in the gaming industry is expected to reach over \$16 billion in 2025 from \$12 billion in 2019 (a CAGR of 5%). Currently, the mobile gaming market is valued at \$77.2 billion and is 48% of the global gaming market. Mobile gaming is predicted to continue growing and outpace the overall growth of console and desktop gaming to become the main avenue for games.

## Mobile Market Leader

Within the mobile gaming market, Unity retains a stronghold as they have focused their optimization on mobile devices. On the contrary, Epic's Unreal Engine is the leader in desktop and personal computer gaming with large AAA studios relying on the Unreal engine to build the latest graphically intense games. The market for mobile gaming is expected to continue growing with the advent of 5G cellular technology that allows for speeds up to 20 times faster than 4G LTE. Increased mobile internet speeds and cloud-based gaming allows for computationally intensive games to be played by mobile users. As a result engine makers that provide the backbone for games stand to benefit as 5G becomes more widely available.

## Opportunity for Growth

Unity's market opportunity lies in industries beyond gaming: the platform is dedicated to providing solutions in the virtual and augmented reality space, and they are well-positioned to dominate this industry. Currently, only 8% of its large customers come from industries beyond gaming, but the AR and VR market is expected to grow substantially. Some reports estimate that the market is expected to grow from \$213 million in 2017 to \$673 billion in 2025 (Statista reports that this is likely driven by technological advancement in connectivity). AR and VR software is expected to be included in both recreational and commercial applications. Device makers have created standalone devices and headsets that integrate a user's smartphone to create an AR/VR experience at a low cost. Given the billions of smartphone users, there is an untapped potential for AR/VR entertainment that leverages powerful game engines such as Unity and Unreal.

# Investment Risks

## Unity's Expansion into Non-Gaming Markets

Unity's management and investments have made it clear that they emphasize expansion into non-gaming markets, such as architecture, engineering, automotive spaces, 3D film and animation, and more. However, this expansion is still at the early stages of gaining traction, name recognition, and educating the markets of their engine's potential and capabilities. On top of this, expansion into non-gaming markets currently requires high spending on advertising as well as further R&D to better match the different needs of non-gaming markets. Given that Unity posts R&D spending numbers of 47% of revenue, even in their pre-profit status, this high spending could prove detrimental and wasteful if Unity is not able to secure new customers in non-gaming markets. Since much of Unity's market value hinges on this potential expansion into new customer segments, any proportional failure in this plan would reduce Unity's future earnings as well as expected market value as factored into the company's current stock price. To quantify their potential earnings in these spaces, the market opportunity in non-gaming markets can be approximated to \$17B (of TAM, total addressable market) in comparison with \$12B from the gaming industry. Since Unity only derives 8% of their revenue from non-gaming markets, there exists huge potential, but also significant failures possible in this necessary market expansion move.

## Potential New Entrants into the AR Market

The era of AR as "the next major computing platform after mobile" faces a variety of technological barriers. This means that this era could be a decade or more away- which gives other competitors time to advance their positioning in different areas within the AR market. These competitors include "tech giants" that are yet to be founded, or current tech giants such as Google, Apple, Facebook, and Microsoft- all of which are currently collaborating with Unity, but could decide to eventually compete with Unity by developing their own AR-focused engine. According to a Harvard Business Review report, over 87% of these larger-scale companies are considering and piloting shifts into mixed reality products, serving as potential competitors or customers that Unity would need to capture to maintain status as market leader. As the current market leader in the AR/VR space, any loss in Unity's 60% market share would prove harmful for Unity's future revenue flows. Additionally, new entrants into the AR/VR space would force higher levels of R&D needed for Unity to remain competitive and thus further reduce Unity's return on invested capital.

# Valuation

## Comparables Model: Unity is Pre-profit

Unity is pre-profit as a result of its high R&D costs, so discounted cash flows analyses provide limited insight into the fundamental value of the firm. For this reason, we chose to rely on a comparables model centering on eleven peer firms. Our preferred multiple was EBITDA-SMRD, which accounts for sales, marketing and research and development costs. Firms were chosen on the following criteria: market capitalization, business lines, industry, geographic location, and maturity.

### Firms

Company Name	Stock Price	Shares Outstanding	Market Cap	Enterprise Value	Revenue	EBITDA - SMRD	Book Value	EV/Revenue	EV/EBITDA - SMRD	P/S	P/B
Guillemot Software (GWRE)	\$128.60	83.754	10,778.30	8,963.65	755.10	447.58	33.82	13.15x	22.28x	14.27x	6.48x
Zenobe (ZBN)	\$115.98	117.8	13,505.56	15,111.72	1,025.66	827.53	1.67	17.96x	22.37x	17.58x	41.25x
Electronic Arts (EA)	\$145.78	287.6	41,826.33	46,217.10	5,675.00	3,993.00	37.69	6.35x	10.68x	7.38x	5.27x
Activision Blizzard (ATVI)	\$103.96	773.0	79,577.78	74,533.40	8,088.00	1,219.00	39.46	9.23x	14.23x	8.84x	5.27x
Ames (AMES)	\$393.27	85.0	34,113.40	34,214.10	1,541.80	3,589.00	623.20	22.28x	9.55x	10.24x	7.55x
Autodesk (ADSK)	\$302.52	215.9	67,724.30	68,257.70	3,650.56	2,821.00	5.32	18.69x	26.3x	14.01x	N/A
Aviz (AVIZ)	\$22.12	44.2	1,008.86	1,204.00	373.53	244.10	176.90	3.21x	4.9x	2.84x	N/A
Synopsys (SNPS)	\$289.76	151	43,424.50	43,914.80	3,693.30	2,725.60	32.10	11.90x	16.3x	12.3x	8.84x
Take-Two Interactive Software (TTWO)	\$185.95	105.6	20,184.00	18,348.80	3,793.90	1,175.01	28.75	5.51x	15.4x	6.37x	6.5x
Snowflake (SNOW)	\$269.08	283.3	76,176.56	71,626.40	489.33	890.03	11.15	146.39x	80.1x	155.68x	26.3x
Ubisoft Entertainment (UBI)	\$82.13	123.2	10,143.06	10,678.10	1,497.00	1,087.70	12.36	5.35x	9.8x	5.08x	6.7x
Mean:	\$188.19	207.36	46,710.04	35,205.18	2,775.38	3,039.32	54.69	15.6x	22.7x	20.2x	10.73x
Median:	\$193.68	133.2	34,513.40	34,214.10	1,997.00	1,175.03	39.46	11.90x	15.4x	12.34x	7.55x
Unity (U)	\$110.61	273.5	30,255.96	28,427.96	772.4	401.652	7.45	37.0x	67.5x	38.17x	14.85x

Figure 1: Statistics and Multiples

### Implied Share Prices

We found the 25<sup>th</sup>, 50<sup>th</sup>, and 75<sup>th</sup> quartile for each relevant statistic and produced a series of implied share prices from these statistics.

Implied Prices				
	EV/Revenue	EV/EBITDA - SMRD	P/S	P/B
Median	\$33.60	\$43.62	\$34.85	\$21.32
25th	\$16.80	\$27.32	\$15.91	\$18.81
75th	\$51.79	\$56.91	\$41.30	\$24.96

Figure 2: Unity Implied Share Price

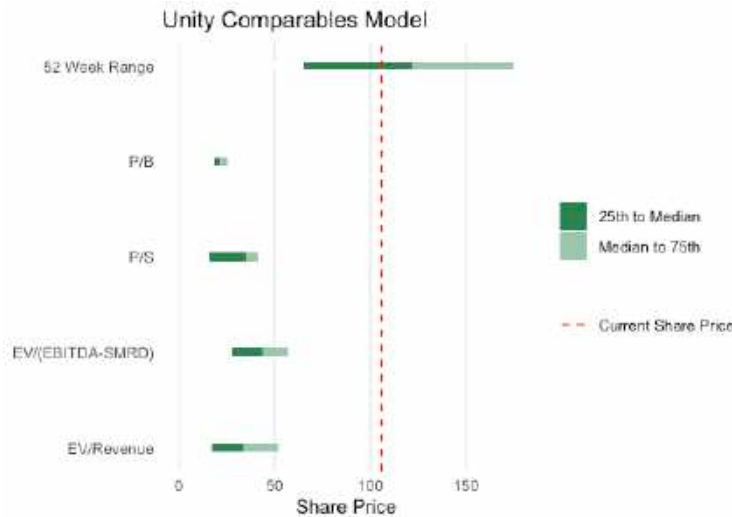


Figure 3: Unity Implied Share Prices Visualized

### The market fails to realize Unity's true value as a leader in the game engine space

Despite the implied share prices being far lower than Unity's 52 week range, we believe that Unity's strong position as the market leader in the game engine space presents strong growth potential. None of the peer companies included in this model reflect Unity's true market position as a unique firm, making this analysis limited in forecasting potential.





**Promontory Investment Research**  
Winter 2021 Report, Issue 8  
[promontoryir.com](http://promontoryir.com)