

Company Presentation February 2019

Forward Looking Statements

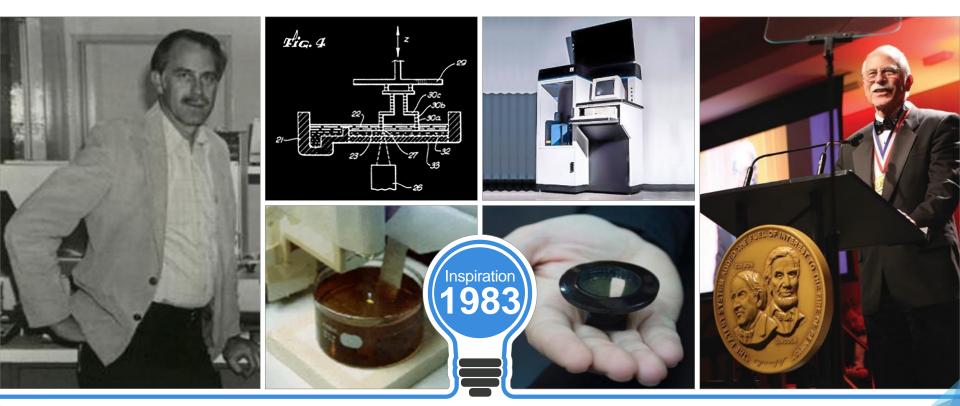
This presentation contains certain statements that are not statements of historical or current facts are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements include statements concerning plans, objectives, goals, strategies, expectations, intentions, projections, developments, future events, performance or products, underlying assumptions, and other statements which are other than statements of historical facts. In some cases, you can identify forward-looking statements by terms such as "believes," "beliefs," "may," "will," "should," expects," "intends," "plans," "anticipates," "estimates," "projects," "potential," "continue," and other similar terminology or the negative of these terms. From time to time, we may publish or otherwise make available forward-looking statements of this nature. All such forward-looking statements, whether written or oral, and whether made by us or on our behalf, are expressly qualified by the cautionary statements described on this message including those set forth below.

Forward-looking statements are based upon management's beliefs, assumptions and current expectations concerning future events and trends, using information currently available, and are necessarily subject to uncertainties, many of which are outside our control. In addition, we undertake no obligation to update or revise any forward-looking statements made by us or on our behalf, whether as a result of future developments, subsequent events or circumstances, or otherwise, or to reflect the occurrence or likelihood of unanticipated events, and we disclaim any such obligation.

Forward-looking statements are only predictions that relate to future events or our future performance and are subject to known and unknown risks, uncertainties, assumptions, and other factors, many of which are beyond our control, that may cause actual results, outcomes, levels of activity, performance, developments, or achievements to be materially different from any future results, outcomes, levels of activity, performance, developments, or achievements expressed, anticipated, or implied by these forward-looking statements. Although we believe that the expectations reflected in the forward-looking statements are reasonable, forward-looking statements are not, and should not be relied upon as a guarantee of future performance or results, nor will they necessarily prove to be accurate indications of the times at or by which any such performance or results will be achieved. 3D System's actual results could differ materially from those stated or implied in forward-looking statements. Past performance is not necessarily indicative of future results. We do not undertake any obligation to and do not intend to update any forward-looking statements whether as a result of future developments, subsequent events or circumstances or otherwise.

Further, we encourage you to review "Risk Factors" in Part 1 of our Annual Report on Form 10-K and Part II of our quarterly reports on Form 10-Q filed with the SEC as well as other information about us in our filings with the SEC. These are available at www.SEC.gov.

A Spark of Inspiration



With our technology, expertise and know-how, we are...



Leadership Team



Menno Ellis SVP, General Manager Plastics



Erica Hausheer Chief Information Officer



Chuck Hull EVP, Chief Technology Officer



Andy Johnson EVP, Chief Legal Officer & Secretary



Herbert Koeck SVP, General Manager, Go to Market



Radhika Krishnan SVP, General Manager Software Workflow Business



Kevin McAlea EVP, General Manager, Metals & Healthcare



John McMullen EVP, Chief Financial Officer



Sadie Stern SVP, Human Resources



SVP, Marketing and Demand Generation

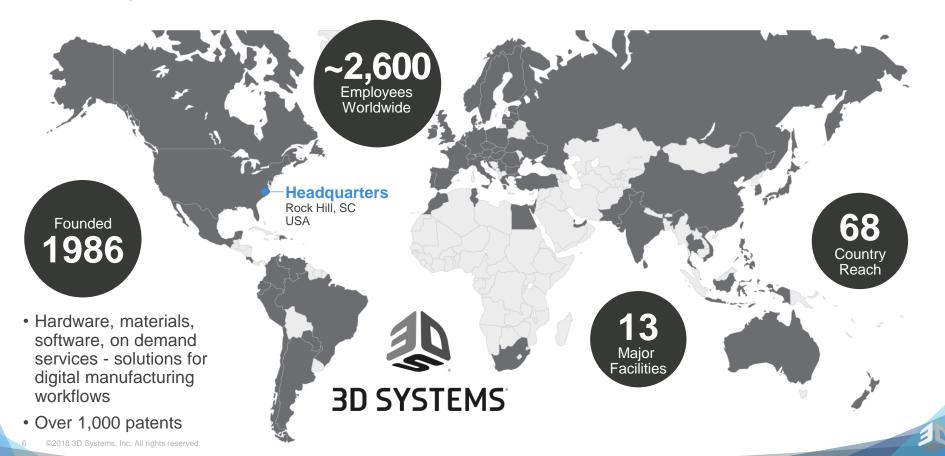


Vyomesh Joshi (VJ) Chief Executive Officer

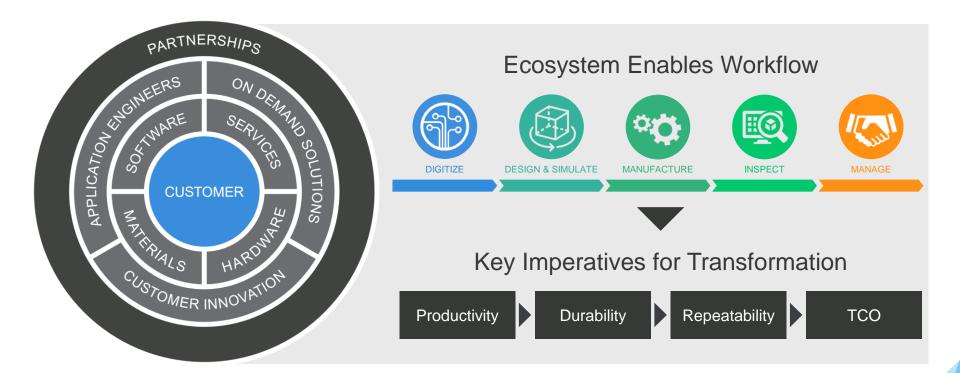


Phil Schultz EVP, Operations

3D Systems—Global Footprint



Making 3D Production Real



3D Systems Transformation Journey

Listen, Learn and Build

2016

Create Foundation for Growth

2017-2018

Key Success Factors

Customer-Driven Innovation

Operational Excellence

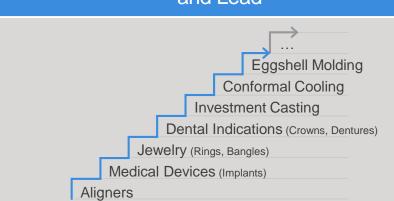
Partnerships

Scale and Lead



- · Improve reliability, quality and win back customer confidence
- Prune product portfolio
- Understand the market trends and requirements for shift from prototyping to production
- Augment talent

- Our People
 - · Customer-driven innovation
 - World-class cost structure
 - Operational excellence
 - Partnerships
 - Talent and leadership



- Innovative production workflows and solutions
- Materials portfolio expansion

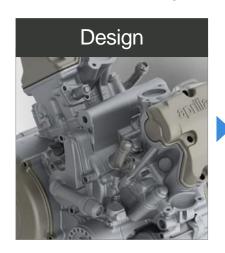
2019

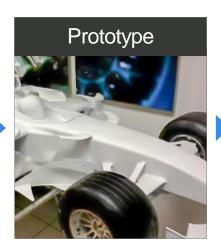
- Uptime-based technology services
- Scaling customer innovation center (CIC) implementation & certified manufacturing partners
- Expanding solutions and market

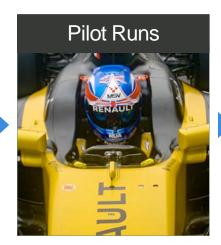
← April 2016

Customer Engagement Model

Product Lifecycle









Customer Use Cases

Materials

Hardware and Software Technology Pre-Sales
Application
Engineering

Propose Solution Uptime Based On Predictive Support

Vertical Approach and Domain Expertise

Core Assets form Operational Platform



Healthcare

Unmatched Expertise and Capabilities



Dental

Redefining Digital Dentistry

Fully Integrated Solution



Broadest Digital Dentistry Portfolio in the Industry



30 materials for 12 indications

Clinical Validation and Regulatory Approval

Aerospace

Cert./Qualification





Fuel Economy



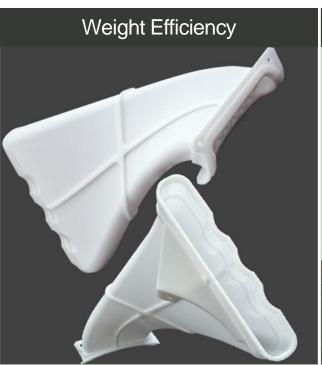
Airworthy Parts



Supply Chain



Automotive



Improved Product Design



Supply Chain



Formula 1 Vents

CAD to Car in 8 weeks

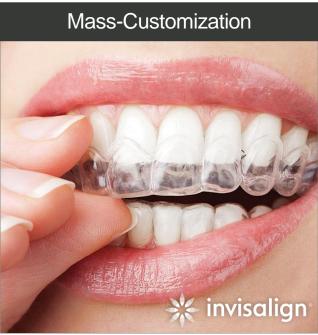
Rapid Availability of Parts

Durable and Consumer Goods

Innovation in Product Design and Production

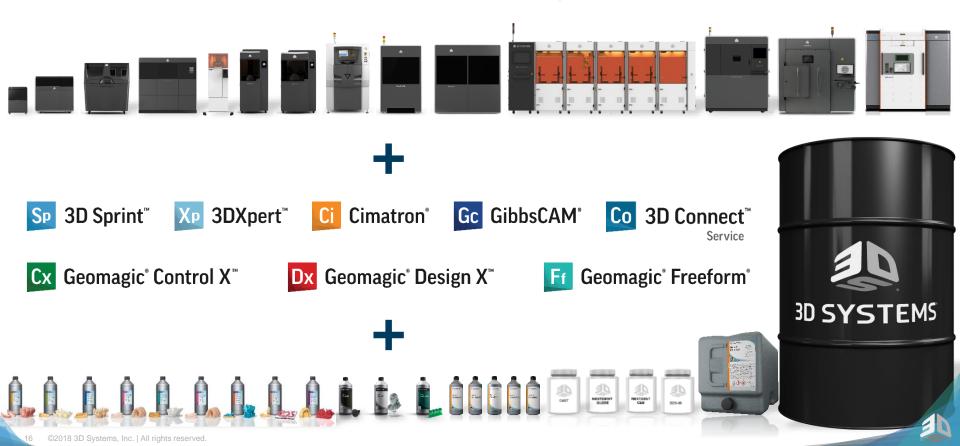






Reduce Inventory and Increase Supply Chain Velocity

Broadest Additive Manufacturing Solution Portfolio



Powerful Plastics Portfolio







ProJet® MJP 2500 Series

High quality, speed and ease-of-use



New PROJET® CJP 260Plus

Most affordable color 3D solution



High 3D printing throughput, highest accuracy and detail



Production ready for tough, functional nylon parts





It Starts With Materials

Plastics, Nylons, Metals, Waxes, Composites, Ceramics, Etc.

- 500+ years of combined experience
- 100+ plastics materials
 - Wide range of plastics
 - Wide range of applications and markets
- Customer-driven innovation
 - Partner with 3rd party formulation companies and researchers
 - Partner with chemical developers and producers, to enable new formulations



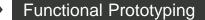
Figure 4[™]

Scalable Production Platform

- Scalable, production platform Inline, integrated and fully automated post processing
- Up to 15x faster throughput (print speeds up to 100 mm/hr.)

- Six sigma repeatability an industry first! $(C_{pk} > 2)$
- Up to 20% lower part cost (at a volume of 500 parts) than traditional methods

Design Verification



Bridge Manufacturing

1MM+ Production Runs



Materials

200 ka (55 gallon Cartridges







Imaging









Print Plates

Figure 4[™] Products

Standalone Solutions

INDEPENDENT PRINTERS | AFFORDABLE EASE OF USE | ADAPTABLE



NextDent[™] 5100

Dental labs small & large 10+ dental use cases Up to 10x lower part cost Up to 5x faster



Figure 4 Standalone

Small design shops, OEMs smaller service providers

Affordable
Functional prototypes
Ideal in emerging geographies

Factory Solutions

INTEGRATED MODULES | CONNECTED FULL AUTOMATION | PROCESS CONTROL



Figure 4 Modular

Service providers medium OEMs Flexible configuration Low volume production Scales with demand



Figure 4 Production

OEMS with high volume production applications

Customizable

1MM+ parts/year

Inline post processing



Industrial Entry-Level Solution — FabPro[™] 1000

New Levels of Affordability, Ease-of-Use and Reliability

- Entry level industrial DLP solution
- Best-in-class speeds, quality & easeof-use
- Rapid concept iteration, jigs/fixtures
- Jewelry, dentistry & urethane cast apps
- Ideal for new-to-3D printing users
- Distributed design workgroups in OEM's



ProJet® MJP 2500 Series

Growth Opportunities with a Proven, High Performance, Versatile Platform



Production-Ready — ProX[®] SLS 6100

Functional Nylon Parts — Taking You From RP to Production

- Highly price competitive
- 20% lower TCO than rivals
- High-quality parts
- Superior mechanical properties
- Service bureaus, Aero/Auto, Durable Goods and Healthcare



Precision Metal Printing Solutions

Flexible Solutions

INDEPENDENT PRINTERS | R&D AND PART PRODUCTION



DMP Flex 100 & DMP 200

EDUCATION | INDUSTRIAL | DENTAL

Finest Detail

Best Surfaces

Affordable DMP

Research, R&D, Small Parts, Dental



DMP Flex 350

HEALTHCARE | AEROSPACE INDUSTRIAL/CONTRACTORS

Robust printer

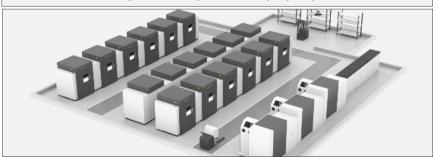
Repeatable Quality

Low TCO

Upgradable to DMP Factory 350

Factory Solutions

SCALABLE | HIGH LEVEL OF AUTOMATION FULLY INTEGRATED MODULES



DMP Factory 350 & DMP Factory 500 Solutions

OEMS | LARGE PART CONTRACTORS

Medium volume production

Largest part diameter in the industry

Repeatable quality, high productivity, low TCO



DMP Factory 500 Solution with +GF+ Partnership

- Seamless big parts up to 500mm diameter Workflow oriented modularity — for configurable factory set-up
- With 500x500x500 mm largest diameter in the industry
- Vacuum chamber with lowest oxygen atmosphere during builds (20 ppm)

Full traceability of metal powder batches — removable print module with integrated overflow hopper

Very low consumable material cost

OEMs and large part contractors are looking for:

> Uniform Repeatability, Part Quality Affordable Part Cost/TCO

Scalability, Including Managing Peaks

Service and Support, Including **Application Guidance**

Industry 4.0 — Data-flow/Logging/Monitoring



Precise, High-Performance Metals

- Strategic relationships powder suppliers provide powders made to specification
 - Robust parameter sets for these powders and test via ASTM, SAE, etc. requirements for the relevant alloys
 - When customers use our powders and parameter sets, we guarantee output quality
- Supply open configuration files for customers who want to develop their own materials
- Participate in R&D of new or novel alloys, both with suppliers and customers



Production Workflow Software Portfolio



3D Digitization Platform

Manufacturing Software Platform



Productivity • Ease of Use • ROI

3D Sprint

- 3D print better parts without needing high-priced software
 - Increase efficiency with optimized management of data
 - Be more productive and reduce printer down time
 - Single, easy user interface streamlines time-to-print





3DXpert[™]

The Only All-In-One Software Solution for Metal Additive Manufacturing



- Metal printers + 3DXpert + LaserForm® powders
- The only vendor to offer a real complete workflow for design for AM
- Dedicated solution for medical, aerospace & automotive industries



Geomagic® Design X 2019

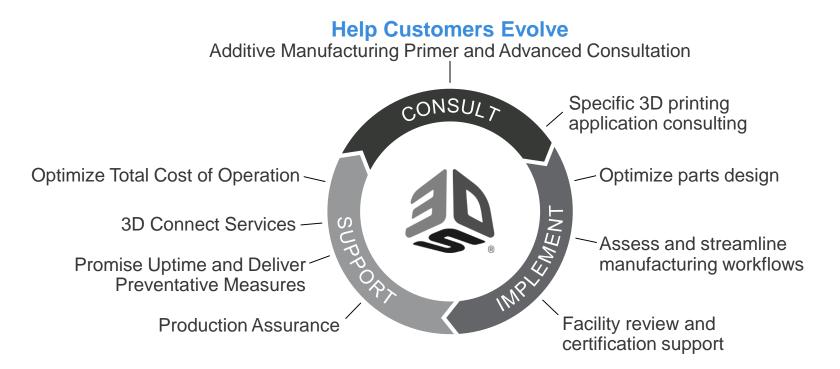
The Fastest Path from Scan to CAD

- The only reverse engineering solution to combine feature-based CAD with 3D scanning!
- Design in days, not weeks
- Improved speed, quality and user experience in 2019

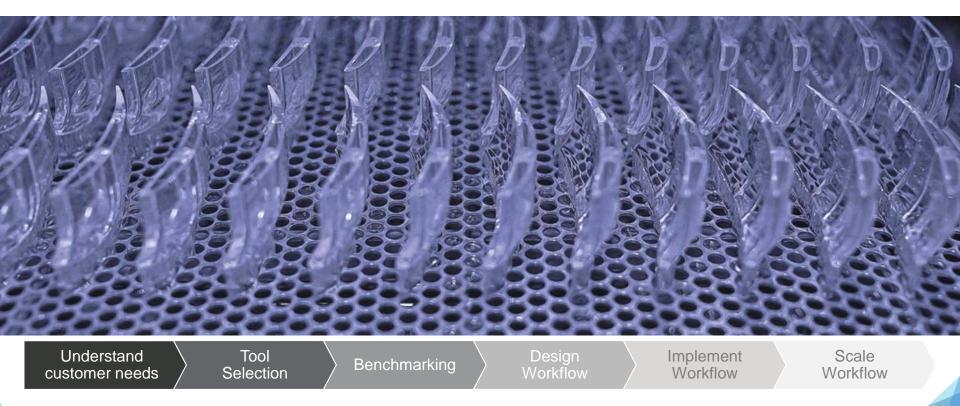


Global Customer Services

Guiding Customers along the Additive Manufacturing Journey



Application Engineering Consulting



Support Services





Customer Innovation Centers

Services



Expert in-house customer training

Benchmarking



4-step standardized and trackable process for high quality benchmarking

Application Support

Technical application support and development

Part Manufacturing



Batch manufacturing for customers and prospects ISO 9001/13485 certified facilities



Our Mission

Accelerate the development of advanced applications by providing the expertise, know-how and state-of-the-art technology necessary to develop, validate and commercialize products.



On Demand Manufacturing

Rapid Prototyping

Time + Money

Explore look and feel before committing to costly production









Low-volume Production





Functional Prototyping

Beyond Look and Feel

Assess real-world usability, ergonomics, manufacturability, and materials before production







Different processes availab for functional prototyping

On average, every functional prototype is created with three different processes



100 Application Engineers
With an 10 + Years of



25,000+Functional prototype

Appearance Models



On Demand Subtractive Manufacturing

- Emerging market of Hybrid Manufacturing
- Uniquely position to offer both solutions
- Compliments additive solution.
 - Post print machining
 - Printed jigs and fixtures
 - CAM for hybrid machines
- Traditional Manufacturing
 - Large part of global manufacturing market



Cloud-Based Services



Fleet Monitoring

- Enables customers to see the status of their printer in real time
- Enables email and text alerts with their build or printer
- Creates analytics on up time, usage, consumable use, health of the lasers/print heads etc.

ALL NEW

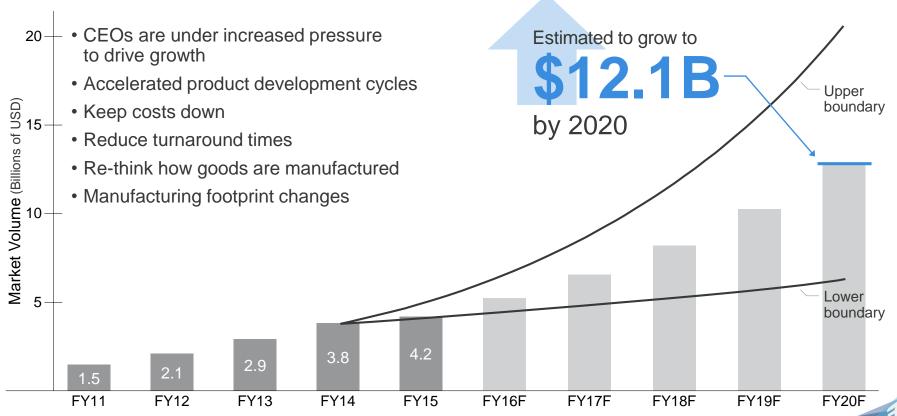


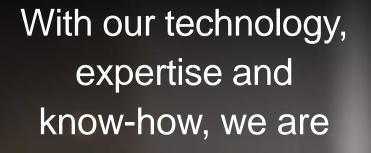
Remote Diagnostic Tools

- Creates the ability for service to see what the problem is prior to going on site
- Automatically creates a service ticket
- Enable the ability to have the right spare parts ordered and on site prior to the tech arriving

ALL NEW

Total Market Opportunity





MAKING 3D PRODUCTION REAL





Recent Financials

2018 Revenue Drivers

During 2018, we continued to deliver on growth drivers, and total revenue increased 6% in 2018 compared to 2017



Printer revenue increased 25% on a 76% increase in printer unit sales



Software revenue growth of 5%



Healthcare solutions growth of 19%



On demand services growth of 2%



Materials revenue growth of 1%

GAAP Operating Results

		F	ourth Quarter				Full Year	
(in millions, except per share amounts)	2018		2017	Y/Y Change Better/(Worse)	2018	2017 7 \$ 646.1 8 304.8 9 47.2% 8 264.2 8 94.6 8 358.8 55.5% 9 (54.0) 8 (8.4)%	Y/Y Change Better/(Worse)	
Revenue	\$ 180.7	\$	177.3	2%	\$ 687.7	\$	646.1	6%
Gross Profit	82.6		85.5	(3)%	324.4		304.8	6%
Gross Profit Margin	45.7%		48.2%	(250) bps	47.2%		47.2%	0 bps
SG&A	66.1		68.2	3%	272.3		264.2	(3)%
R&D	23.5		23.0	(2)%	95.3		94.6	(1)%
Operating Expenses	89.6		91.2	2%	367.6		358.8	(2)%
% of Revenue	49.6%		51.4%		53.5%		55.5%	
Operating Loss	(7.0)		(5.7)	(23)%	(43.2)		(54.0)	20%
% of Revenue	(3.9)%		(3.2)%		(6.3)%		(8.4)%	
Net Loss per 3D Systems	\$ (4.1)	\$	(10.1)	59%	\$ (45.5)	\$	(66.2)	31%
% of Revenue	(2.3)%		(5.7)%		(6.6)%		(10.2)%	
Loss Per Share	\$ (0.04)	\$	(80.0)	50%	\$ (0.41)	\$	(0.59)	31%

Non-GAAP Financial Measures

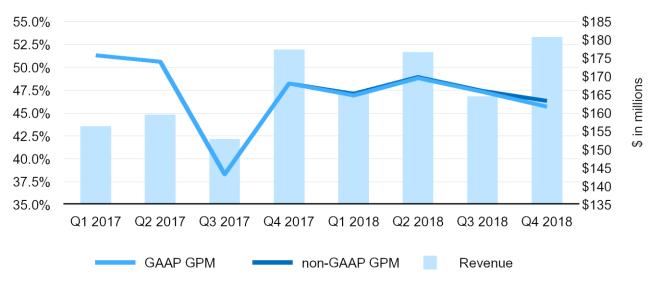
		Fo	ourth Qua	arter			Full Yea	ar
(in millions, except per share amounts)	2018		2017	Y/Y Change Better/(Worse)	2018 2017		Y/Y Change Better/(Worse)	
Non-GAAP R&D Expense	\$ 23.5	\$	23.0	(2)%	\$ 94.8	\$	94.6	— %
Non-GAAP SG&A Expense	52.2		54.6	4%	213.1		202.0	(5)%
Non-GAAP Operating Expenses	\$ 75.7	\$	77.6	2%	\$ 307.9	\$	296.6	(4)%
Non-GAAP Net income (loss) attributable to 3D Systems Corporation	\$ 11.4	\$	5.3	115%	\$ 16.5	\$	(1.7)	1071%
Non-GAAP Net income (loss) per share available to 3D Systems Corporation common stockholders - basic and diluted	\$ 0.10	\$	0.05	100%	\$ 0.15	\$	(0.02)	850%

^{*} Tables may not foot due to rounding; amounts calculated based on dollars in thousands.

We use non-GAAP measures to supplement our financial statements presented on a GAAP basis because management believes non-GAAP financial measures are useful to investors in evaluating our operating performance and to facilitate a better understanding of the impact that strategic acquisitions, non-recurring charges and certain non-cash expenses had on our financial results. See appendix for reconciliation of non-GAAP items.

Gross Profit and Margin

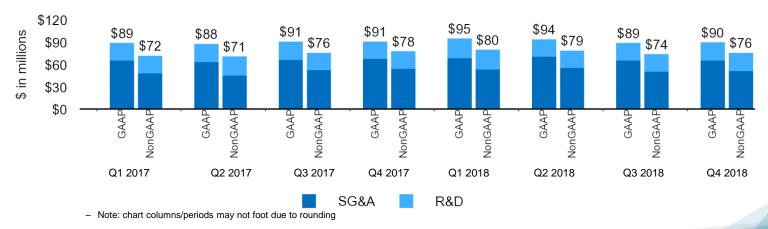
- For the full year 2018, GAAP GPM was 47.2% and non-GAAP GPM was 47.4%
- Supply chain efficiencies and cost improvements were offset by the impact of sales mix, costs to launch and ramp new products, and lower on demand manufacturing gross profit margins



- GAAP and non-GAAP data points may overlap on the chart when within approx 50 basis points

Operating Expenses

- Although we expect some fluctuations quarter to quarter, we are beginning to see the results of actions we
 are taking to reduce cost structure
- Shifting from R&D to marketing and sales support of the new products rolled out in 2018, and expect R&D in 2019 to be focused on materials and software



Balance Sheet and Cash

- Generated \$7.7 million of cash from operations during Q4 2018, and generated \$4.8 million of cash from operations during the full year 2018
- Ended 2018 with \$110.0 million of cash on hand, including \$25 million of proceeds from our revolving credit facility
- Our existing \$150 million revolver was nearing the end of its original term, so we initiated a new revolver for \$100 million dollars and a \$100 million five-year term loan, which closed Feb 27, 2019, repayable at any time without penalty. We believe this provides the right level of liquidity support while we shift from our investment phase to cash generation in 2019
- While cash use and generation will continue to fluctuate from quarterly, expect organic free cash flow in 2019, as we begin to reduce inventory and capital expenditures and drive improved profitability

Summary and Outlook

- Made significant progress in our turnaround and transformation work, and have a strong operational foundation in place with improved processes across the company, and with the new products launched in 2018, an unmatched portfolio
- We expect 2019 revenue growth to continue to be driven by growth in printers, materials, healthcare and software
- We believe we have significant opportunities across our key verticals and are increasing our market share in several categories while also expanding our market opportunities with new solutions and additional capabilities
- With our improved operations, execution and unmatched portfolio, we believe we are well positioned to drive continued and increasingly profitable growth in 2019 and beyond

Financial Appendix & Non-GAAP Reconciliations



Fourth Quarter and Full Year Non-GAAP Earnings (Loss) per Share

					_				
	C	uarter Ende	d Dec	ember 31,		Full	Year		
(in millions, except per share amounts)		2018		2017		2018		2017	
GAAP Net loss attributable to 3D Systems Corporation	\$	(4.1)	\$	(10.1)	\$	(45.5)	\$	(66.2)	
Adjustments:									
Amortization, stock-based compensation & other ¹		13.9		15.1		58.7		62.9	
Legal and acquisition-related ²		0.1		(1.4)		(2.0)		(0.1)	
Cost optimization plan ³		1.5		_		4.0		_	
Impairment of cost-method investments ⁴		_		1.7		1.4		1.7	
Non-GAAP net income attributable to 3D Systems Corporation	\$	11.4	\$	5.3	\$	16.5	\$	(1.7)	
Non-GAAP net income per share available to 3D Systems common stock holders - basic and diluted $^{\rm 5}$	\$	0.10	\$	0.05	\$	0.15	\$	(0.02)	

¹ For the quarter ended December 31, 2018, the adjustment included \$(0.2) in COGS and \$14.1 in SG&A. For the quarter ended December 31, 2017, the adjustment included \$0.1 in COGS and \$15.0 in SG&A. For the twelve months ended December 31, 2018, the adjustment included \$0.1 in COGS and \$58.6 in SG&A. For the twelve months ended December 31, 2017, the adjustment included \$0.4 in COGS and \$62.5 in SG&A.

² For the quarter ended December 31, 2018, the adjustment included \$0.6 in COGS \$(1.0) in SG&A and \$0.5 in interest and other income (expense), net. For the quarter ended December 31, 2017, the adjustment included \$0.6 in COGS, \$(1.7) in SG&A and \$(0.9) in interest and other income (expense), net. For the twelve months ended December 31, 2017, the adjustment included \$(0.3) in SG&A and \$0.2 in interest and other income (expense), net.

³ For the quarter ended December 31, 2018, the adjustment included \$0.7 in COGS, \$0.8 in SG&A and \$0.0 in R&D. For the twelve months ended December 31, 2018, the adjustment included \$1.1 in COGS, \$2.4 in SG&A, and approximately \$0.5 in R&D.

⁴ The Company has minority investments of less than 20% ownership in enterprises that benefit from, or are powered by its technology portfolio. The value of each of these investments is assessed periodically, and impairment recorded when required. For the quarter and twelve months ended December 31, 2018, the adjustment included zero and \$1.4 in interest and other income (expense), net. For the quarter and twelve months ended December 31, 2017, the adjustment included \$1.7 in interest and other income (expense), net. The Company excluded this amount as it is not related to on-going operations, and intends to exclude these impairment amounts from non-GAAP net income going forward.

⁵ Denominator based on weighted average shares used in the GAAP EPS calculation.

^{*} Tables may not foot due to rounding; amounts calculated based on dollars in thousands.

2018 Non-GAAP Gross Profit & Margin

						2018				
				Quart	ter End	ded			Y	ear Ended
(in millions)	N	larch 31		June 30	September 30		December 31		D	ecember 31
GAAP Gross Profit	\$	77.9	\$	86.2	\$	77.8	\$	82.6	\$	324.4
GAAP Gross Profit Margin		46.9%	Ó	48.8%	ó	47.3%		45.7%		47.2%
Adjustments:										
Amortization, stock-based compensation & other	\$	0.1	\$	0.1	\$	0.1	\$	(0.2)	\$	0.1
Legal and acquisition-related	\$	_	\$	_	\$	_	\$	0.6	\$	0.6
Cost optimization plan	\$	0.2	\$	0.2	\$	0.1	\$	0.7	\$	1.1
Non-GAAP Gross Profit	\$	78.1	\$	86.4	\$	78.0	\$	83.6	\$	326.2
Non-GAAP Gross Profit Margin		47.1%	,	48.9%	ó	47.4%		46.3%		47.4%

^{*} Tables may not foot due to rounding; amounts calculated based on dollars in thousands.

2018 Non-GAAP Operating Expenses

	2018												
(in millions)			Y	ear Ended									
	M	larch 31	June 30		September 30		December 31		De	cember 31			
GAAP R&D Expenses	\$	25.9	\$	22.7	\$	23.2	\$	23.5	\$	95.3			
GAAP SG&A Expenses		69.5		71.2		65.6		66.1		272.3			
GAAP Operating Expenses	\$	95.3	\$	93.9	\$	88.8	\$	89.6	\$	367.6			
Adjustments to R&D Expenses:													
Cost optimization plan 1		_		0.2		0.3		_		0.5			
Non-GAAP R&D Expenses	\$	25.9	\$	22.5	\$	22.8	\$	23.5	\$	94.8			
Adjustments to SG&A Expenses:													
Amortization, stock-based compensation & other		15.1		14.3		15.1		14.1		58.6			
Legal and acquisition-related		0.4		(0.4)		(0.7)		(1.0)		(1.7)			
Cost optimization plan		0.4		0.7		0.4		0.8		2.4			
Total Adjustments to SG&A Expenses		15.9		14.6		14.8		13.9		59.2			
Non-GAAP SG&A Expenses	\$	53.6	\$	56.6	\$	50.8	\$	52.2	\$	213.1			
Non-GAAP Operating Expenses	\$	79.4	\$	79.1	\$	73.7	\$	75.7	\$	307.9			

¹ For the quarter ended March 31, 2018, the adjustment included approximately \$32 thousand and therefore rounded down.

^{*} Tables may not foot due to rounding; amounts calculated based on dollars in thousands.

2017 Non-GAAP Gross Profit & Margin

	2017												
(in millions)					Year to Date								
		March 31		June 30		September 30	December 31			December 31			
GAAP Gross Profit	\$	80.2	\$	80.7	\$	58.5	\$	85.5	\$	304.8			
GAAP Gross Profit Margin		51.3%		50.6%		38.3%		48.2%		47.2%			
Adjustments:													
Amortization, stock-based compensation & other	\$	0.1	\$	0.1	\$	0.1	\$	0.1	\$	0.4			
Legal and acquisition-related ¹	\$		\$	_	\$	_	\$	_	\$	_			
Non-GAAP Gross Profit	\$	80.3	\$	80.8	\$	58.6	\$	85.6	\$	305.3			
Non-GAAP Gross Profit Margin		51.3%		50.7%		38.3%		48.3%		47.2%			

¹ For the quarter ended June 30, 2017, the adjustment included approximately \$21 thousand and therefore rounded down.

^{*} Tables may not foot due to rounding; amounts calculated based on dollars in thousands.

2017 Non-GAAP Operating Expenses

	2017											
		Y	ear Ended									
(in millions)	March 31			June 30		eptember 30	December 31		D	ecember 31		
GAAP R&D Expenses	\$	22.9	\$	24.4	\$	24.4	\$	23.0	\$	94.6		
GAAP SG&A Expenses	\$	66.4	\$	63.1	\$	66.5	\$	68.2	\$	264.2		
GAAP Operating Expenses	\$	89.3	\$	87.5	\$	90.9	\$	91.2	\$	358.8		
Non-GAAP R&D Expenses	\$	22.9	\$	24.4	\$	24.4	\$	23.0	\$	94.6		
Adjustments to SG&A Expenses:												
Amortization, stock-based compensation & other		15.9		16.2		15.8		15.0		62.5		
Legal and acquisition-related		1.1		0.5		(8.0)		(1.4)		(0.3)		
Total Adjustments to SG&A Expenses		17.0		16.7		15.0		13.6		62.2		
Non-GAAP SG&A Expenses	\$	49.4	\$	46.4	\$	51.5	\$	54.6	\$	202.0		
Non-GAAP Operating Expenses	\$	72.3	\$	70.8	\$	75.9	\$	77.6	\$	296.6		

^{*} Tables may not foot due to rounding; amounts calculated based on dollars in thousands.

3D SYSTEMS