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THE FUTURE OF ADDITIVE MANUFACTURING: MATERIALISE'S LBO – STRATEGY & PLANNING

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Abstract

The Future of Additive Manufacturing: Materialise's LBO

This investment paper reviews the potential LBO of Materialise, a service provider and software producer within the AM industry. An analysis of the company and market was conducted, facilitating the assessment of key market trends that enabled the creation of investment strategies. The ultimate result comprised of the execution of a leverage buyout with strong returns in every scenario, demonstrating Materialise as investment worthy. This section focuses deeper on the fund's investment strategies for both organic growth, by increasing its global presence, focusing on the future, optimizing performance, and inorganic growth, by buying Stratasys.

Keywords: 3D Printing, Addictive Manufacturing, Materialise, AM industry, Stratasys

Disclaimer:

This report was developed for academic purposes, using non verified publicly available information. As so, we take no responsibility for any action that might derive from the use of this paper for anything other than information.

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Group Paper

Executive Summary

Company Overview

Materialise NV (NASDAQ: MTLN) is a **global provider** of software tools, medical solutions and sophisticated 3D printing services in the Additive Manufacturing (AM) market.

Incorporated in 1990 and headquartered in Leuven, Belgium, Materialise currently has over 2,000 employees and is present in **over 20 countries**.

The company is subdivided in three main segments: **Manufacturing, Software** and **Medical**, which combined offer products to over 8 different industries, including: Automotive, Aerospace, Consumer goods, Healthcare, Machinery, among others.

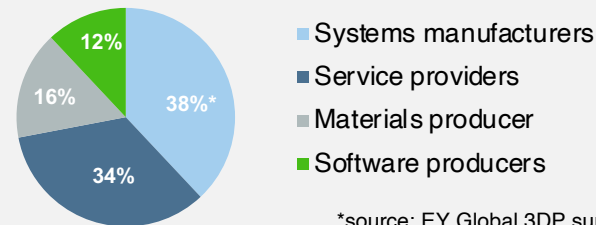
Deal Rationale

- 1 **Strong Competitive Positioning**
Pioneer in 3DP, global reach and disruptive tech.
- 2 **Successful Acquisition History**
6 acq. in the past decade with successful integration
- 3 **Growing Market**
7-Year CAGR estimates vary between 18% to 27%
- 4 **Strong Financials**
Increasing profitability and operating efficiency
- 5 **Highly Skilled Workforce**
3DP expertise both in management and engineering

Market Overview

The Additive Manufacturing market is divided into four industries. Within this division, Materialise is both a **software vendor** and a **service provider**. The overall AM market is estimated to grow from \$10.4bn in 2019 to **\$45.7bn** in 2027 at a **CAGR of 20.3%**.

Share of Companies by Industry

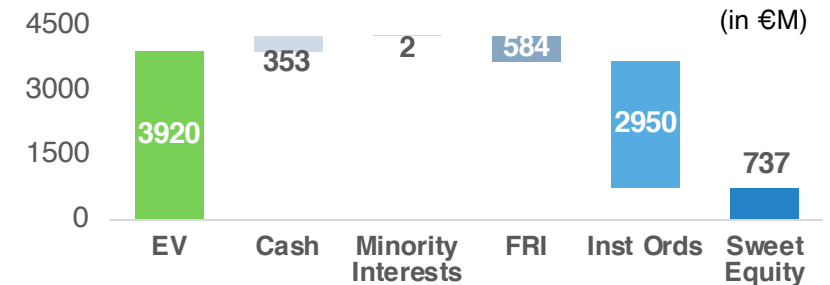


*source: EY Global 3DP survey 2019

Exit Strategy & Returns

Materialise's transaction value (EV) is € 671M with an entry multiple of 25.1x EBITDA. The deal will be financed by 39% of Debt and 61% of Equity.

The exit will be performed in **2026**, with a multiple of 12.1x. The Fund's return is **7.0x MM** and **35% IRR**.



Value Creation Plan

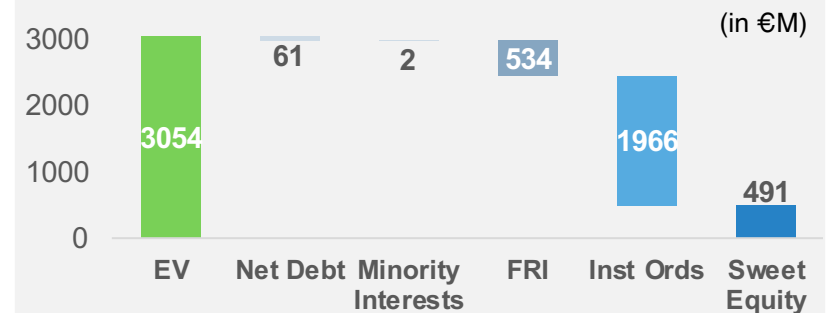
Investment thesis relies on 3 strategies to derive growth:

- A. **Organic Growth** by increasing focus in the APAC region through strategic partnerships, by strengthening Materialise's offer of metal-based printing which a growing AM area and by expanding the customer base in the Americas and Middle East.
- B. **Optimizing Operations** by reducing SG&A and R&D costs as a result of the synergies generated by the strategic acquisition.
- C. **Strategic Acquisition** of a Systems Manufacturer to strengthen Materialise's position in the AM value chain. This vertical integration would allow the company to become an all-in-one supplier.

Contingency Plan

In case the Strategic Acquisition is not successful, a **standalone scenario** of Materialise was performed with a capital structure of 45% of debt and 55% Equity.

In this scenario, exit will occur in **2027**, with a multiple of 25.1x. The Fund's return is **5.0x MM** and **24% IRR**.



Innovation-driven, Materialise operates in 3 different segments within the Additive Manufacturing landscape materialise

Company Overview | Company Profile & History

Company Profile

- Materialise NV (NASDAQ: MTLN) is a **global provider** of software tools, medical solutions and sophisticated 3D printing services in the Additive Manufacturing market.
- One of the largest and most long-established independent company in this sector, Materialise was incorporated on the **28th of June 1990** under the Belgian company law.
- The company currently holds **over 250 patents**, including 160 specifically related to medical applications.
- Multinational company established through a combination of **organic growth** and **acquisitions**.
- Materialise's main subsidiaries include **Engimplan**, **ACTech** and **RapidFit**



Geographical Presence

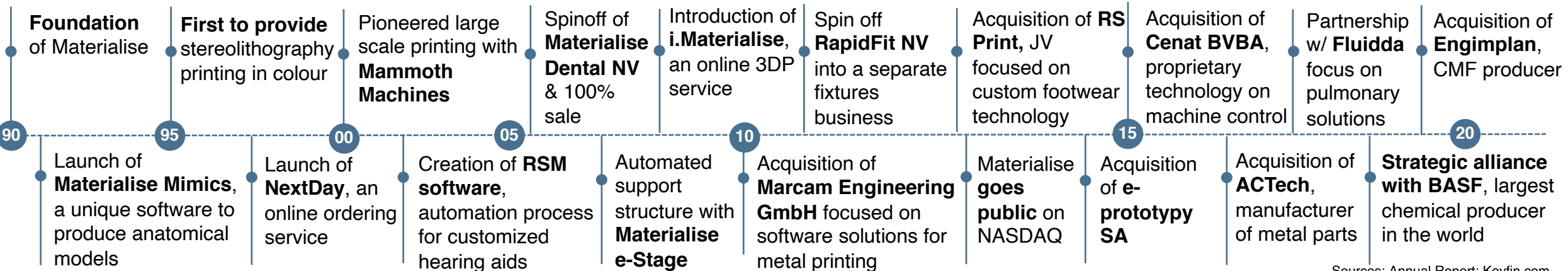


Company Description

Corporate Headquarters: Leuven, Belgium
Market Segments: Manufacturing; Software; Medical
Number of Employees: 2,177

Financial Highlights (2019)

Metrics	5Y CAGR
Sales €196.7M (+ 6,5% vs. 2018)	≈ 16%
Gross Profit €109.7M (+ 7,1% vs. 2018)	≈ 15%
Net Profit €1.7M (- 43,0% vs. 2018)	n.a.
EBITDA €26.7M (+ 13,3% vs. 2018)	≈ 52%



Sources: Annual Report; Koyfin.com



Company Overview | Business Model

Manufacturing Segment

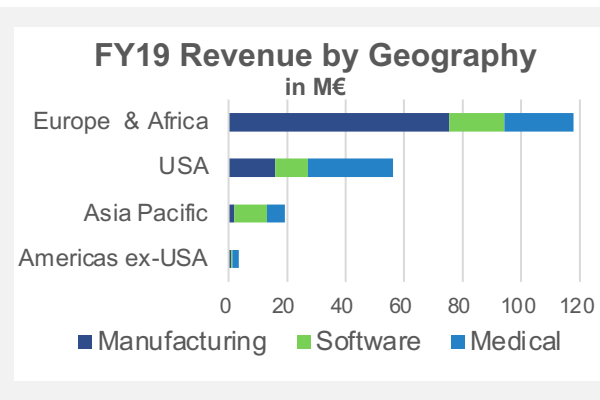
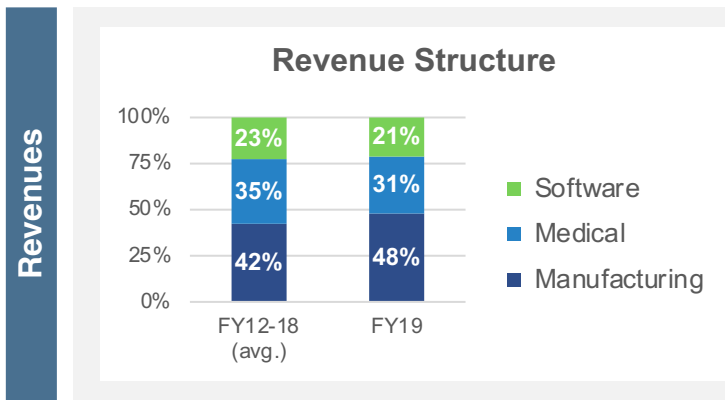
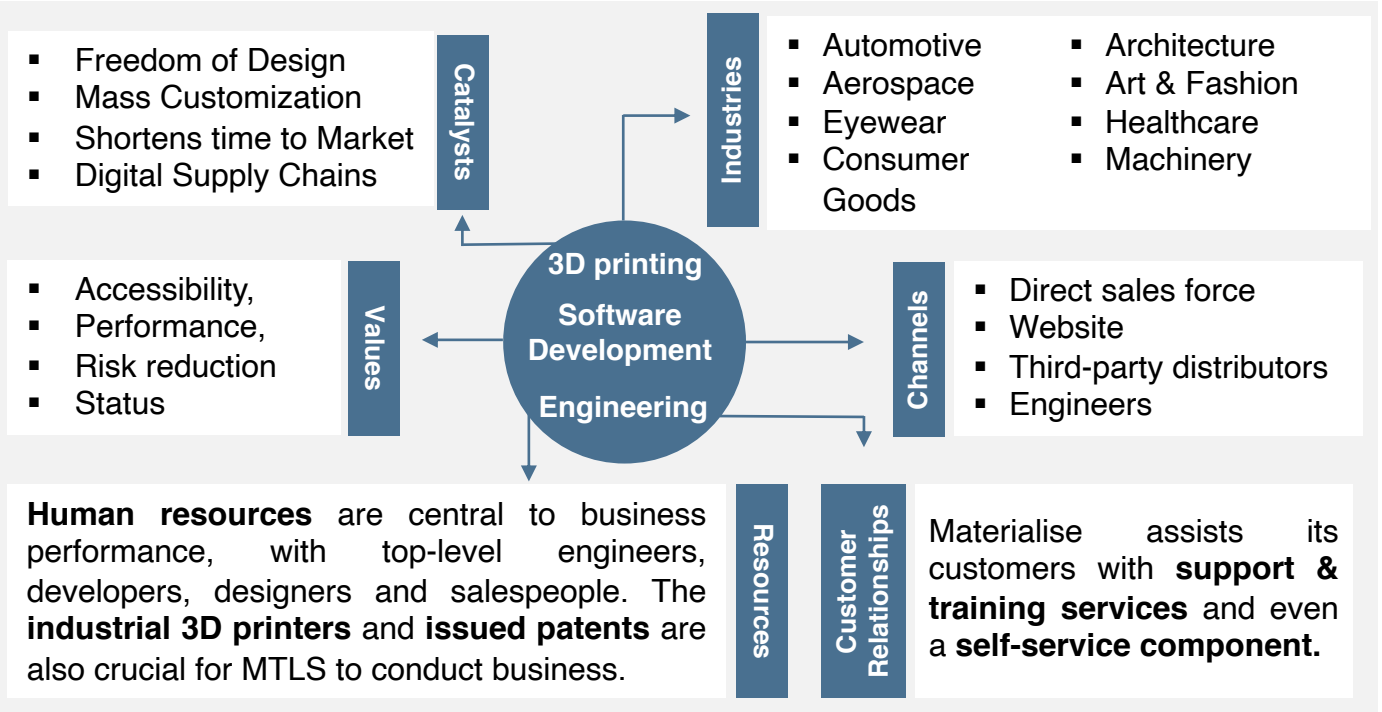
B2B service provider of **3D printing solutions through the co-creation, prototyping and consultancy services** with Materialise's engineers and designers, enabling the production of very complex parts or products using various materials and technologies, on demand.

Software Segment

Provides the necessary **sophisticated software tools** to use additive manufacturing to produce the highest standards' products regardless of complexity levels. It specializes in **workflow software** and is the backbone of 3D printing. It also provides **training and consulting services** for its products. It can also be sold as a standalone product.

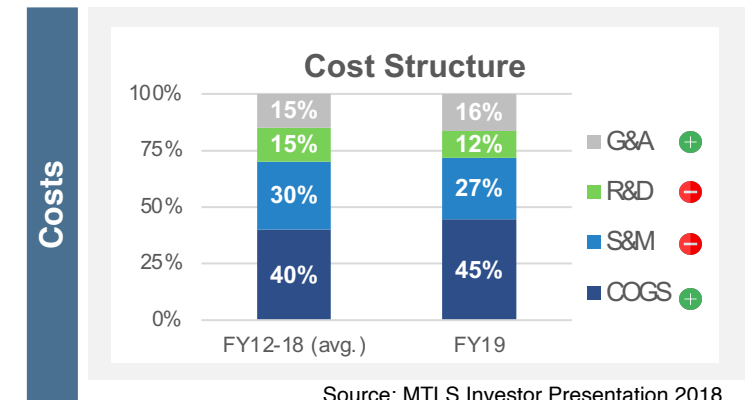
Medical Segment

Provides customers with **medical devices** printed in-house such as **surgical guides and implants, licenses to medical software packages** and **software maintenance contracts** to ensure the level of precision and accuracy required in Certified Medical Printing. Pioneering segment that revolutionizes the care for patients' lives.



Revenue is generated primarily by (i) the sale of software; (ii) 3D printed & complex manufactured products and services

Changes in revenue structure have been heavily affected by the acquisition of ACTech, boosting manufacturing's share of total revenue.



Source: MTLs Investor Presentation 2018

FY19 Highlights

Revenues
€94M

Revenue Share
48%

Growth rate
16.4%

EBITDA
€12M

EBITDA mg
13%

Employees
775 FTE

Revenue Model: The 3D Printing Process

1 Rapid Prototyping

- **Prototypes are essential** to verify the product design with a model that matches the real product, or **to perform form, fit and function** tests, in order to meet the customer's requirements.
- Rapid Prototyping allows designers and engineers to **execute fast and frequent revisions of their designs**. Thanks to a variety of available technologies and materials, 3D-printed prototypes work for both visual and functional testing.

2 Additive Manufacturing

- **Printing of 3D products** to industrial and commercial customers.
- **Co-creation:** Materialise works together with customers during the 3D printing process to solve complex design challenges and to discuss how the introduction of 3D printing can affect product development, manufacturing workflow, business models and customer experiences.
- **i.materialise:** Online service where customers can buy 3D printed products or create their own and offer them for sale to others through this platform.

3 Design and Engineering

- Services provided by highly specialized designers and CAD engineers that offer design and software support for additive manufacturing, including **remodeling and file preparation**, as well as **3D scanning and measuring**.
- These services are intended to add value to the product design, ranging from **improved performance to lowered cost**.

Strategy

"Printing on demand in one of the world's largest 3D printing factories while improving software solutions and acting as incubators for new verticals through the host of co-creations with industry leaders." - Materialise Investor Presentation

Sales and Marketing

The distribution of the **manufacturing services** is carried out by:

- Sales force
- Online portal
- Complex product offerings are addressed directly by specialized sales managers
- Straightforward products can be ordered directly through the automated system "**Materialise OnSite**".

Customer Segments

The customer base for the manufacturing segment are included in the following industries:

- Automotive
- Aerospace
- Healthcare
- Industrial machining art and design
- Consumer products

Ecosystem Partners



Sources: Annual Report, MTLIS Investor Presentation 2018

FY19 Highlights

10 > customers
22%
of Revenue

Revenues
€42M

Revenue Share
21%

Growth rate
11.5%

EBITDA
€14M

EBITDA mg
33%

Employees
303 FTE

Main Products

MAGICS

Revenue Model

- Sources of revenue in this segment are **maintenance contracts, software licenses, and hardware controller sales** along with custom software development services.
- Licensing software products** can be done perpetually or on a time-basis, along with annual maintenance contracts for software updates or support

Magics' applications include:

- repairing and optimizing 3D models & analysing parts
- designing support structures
- making process-related design changes on STL¹ files
- process planning & documenting customer projects
- nesting multiple parts in a single print run

Further offerings help complement the Magics' Platform that provide automation and other productivity improvements.

- Magics Essentials*: entry-level package offering premium data preparation functionality which is used together with machine build preparation software.
- Magics Print*: conglomerates the key build preparation tools and straightforward build file generation technology (offered to machine manufacturers as a product enhancement to their machines' sale). Upgrading to the expert Materialise Magics provides full data and build preparation functionalities in one package:
 - Streamics*
 - 3-maticSTL*
 - e-Stage*
 - Build Processors and Machine Control Software*
 - Materialise Controller*
 - MiniMagics and MiniMagicsPro*

Strategy "Offer proprietary software worldwide through programs and platforms that enable and **enhance the functionality of 3D printers and 3DP operations**" – Materialise Investor Presentation

Sales and Marketing

The distribution of the **software** is carried out by:

- OEM Partner Sales
- Direct Sales
- Third-Party Distributors

Local offices offer technical help before and after the sale. OEMs and dealers often distribute software products combined with 3D printers to enhance the printers' value proposition and application.

Customer Segments

The customer base includes:

- 3D printing OEMs
- Manufacturers in other industries: consumer goods, automotive, aerospace, and hearing aid industries
- R&D departments
- Internal & External 3D printing service offices.

Ecosystem Partners



¹ See glossary for the definitions

Sources: Annual Report, MTLs Investor Presentation 2018

FY19 Highlights

Revenues
€61M

Revenue Share
31%

Growth rate
16%

EBITDA
€11M

EBITDA mg
18%

Employees
763 FTE

3D Printing Machines
32

Subsegments

Medical Software

- Materialise's software allows medical-image based analysis, engineering and 3D printed customized designs of surgical guides, implants and other anatomical models.
- Materialise generates revenues in this sub-segment by **selling licenses** to its medical **software packages** (eg. *Materialise Mimics/ 3-matic/ OrthoView/ ProPlan CMF*) and **software maintenance contracts**.
- Materialise Mimics** is a medical software that allows 3D models to be printed accurately from medical imaging-data eg. CT or MRI's. Currently, there are over 250 hospitals worldwide that use Materialise Mimics Technology, especially in the Cardiac, Orthopedic, Vascular, Neurological and Hepatobiliary areas.

Clinical Services

- Materialise provides customers with 3D printed **surgical guides** and patient specific **medical implants**, allowing doctors to pre-operate in models with the exact scenario they will face in the actual surgical intervention.
- The procedure to develop a customized implant involves: 1) Sending Materialise a CT scan; 2) Materialise's clinical engineers to organise a plan and design a proposal; 3) Doctors evaluating the proposal and give feedback; 4) Materialise producing and shipping the personalised implant, custom instruments and bone models to support the surgery.
- The 3D printed surgical guides include: shoulder, osteotomy, knee and hip replacement surgeries, whilst the 3D printed implants are for shoulder, hip and CMF implants.

Strategy

"Offer products and services that **address long-term trends in the medical industry towards personalized, functional and evidence-based medicine**" - Materialise Investor Presentation

Sales and Marketing

The distribution of **medical software** is carried out by:

- Direct sales force
- Website
- PACS partners

The distribution of **3D printed medical devices** is executed through agreements with collaborative partners. Clinical services may also be carried out by Materialise's own **engineers** that developed close connection with key customers.

Customer Segments

The **customer base** for the Medical Segment products and services include:

- Medical Device Companies
- Hospitals
- Universities
- Research Institutes
- Industrial Companies

Ecosystem Partners

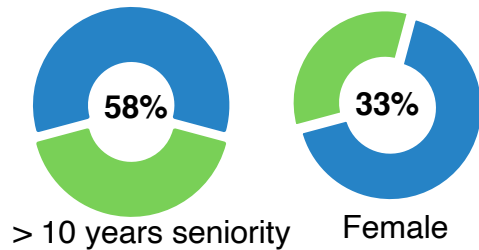


Sources: Annual Report, MTLs Investor Presentation 2018

	KEY MEMBERS	EXPERIENCE	CAPABILITIES	FIT VALUATION
Executive Committee	 Wilfried Vancraen Founder & CEO 30 years	Prior experience: engineering and consulting. Founded Materialise in 1990 and since then has been recognized with several awards as the most influential person in Additive Manufacturing and one of the biggest contributors to the industry (RTAM/SME Industry Achievement Award, 2013 Visionaries! Award)	Product and Industry expertise: Vision, Technical Know-how, Passion.	
	 Peter Leys Executive Chairman 7 years	Prior to being appointed director and Executive Chairman in 2013, Mr. Leys was a Corporate Finance Partner at Baker & McKenzie CVBA. He holds a Candidacy Degree in Philosophy from KU Leuven and Master of Law degrees from the University of Georgia and the KU Leuven.	Financial expertise: M&A knowledge, capital markets understanding, contract building & negotiation, philosophy and law.	

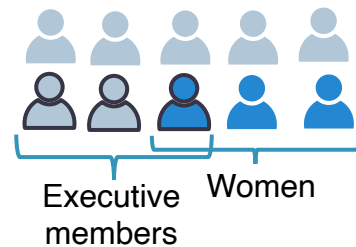
Key Metrics

EXECUTIVE COMMITTEE



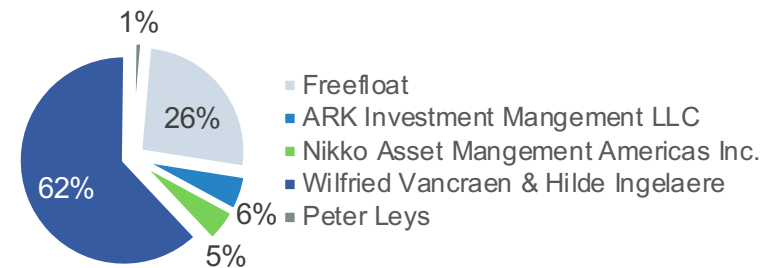
The Executive Committee is composed by 12 members

BOARD OF DIRECTORS



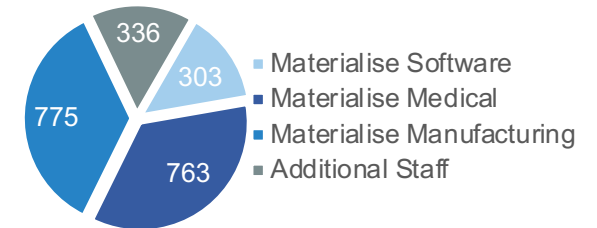
The BoD is composed by 7 fully independent members. There are 2 committees: 1) Audit & 2) Remuneration and Nomination Committee

SHAREHOLDER STRUCTURE



The above graph refers to the beneficial ownership of Materialise's ordinary shares as of April 24th 2020.

EMPLOYEES



Materialise employed 2,177 people in 2019, growing the team by 8.4% YoY.

Sources: See Appendix 1 for further information on the Management Team

Sources: Annual Report, Investor Relations

Company & Market Overview

Value Creation & Business Plan

Exit & Returns

Exit Options & Due Diligence

Company Overview | Management Team

Additional Executive Committee members

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Hilde Ingelaere
Education: 2 Masters - Bioengineering and Business Administration; Experience: Cardiovascular clinical research and business analyst; Materialise: Joined in 1990, became a director in 1997 (managed HR, legal and finance departments) and became Executive VP of MTLN Medical in 2011;
- 

Bart Van Schueren
Education: Master in Mechanical Engineering and PhD in SLM Sintering; Experience: Worked as a liaison engineer & set up research activities of a Co. Materialise: Joined in 1995 and ran the 3D printing service bureau. Became Executive VP in 2011 and CTO in 2016;
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Johan Pauwals
Education: Master in Electro-Mechanical Engineering w/ Stereolithography; Materialise: Joined in 1990 and worked as a software sales manager, Director of Sales and in 2011 became Exec. VP being responsible for global software;
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Johan Albrecht
Education: Master in Corporate Finance; Experience: CFO & member of the Executive Committee (EC) & Director of a global laboratory (BARC NV); EC of Cerba European Lab (acquirer of BARC); Materialise: Joined in 2015 in representation of Alfinco BVBA;
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Stearaan Motte
Education: 2 Master - Mathematics and Applied Informatics; Experience: Software architect and project manager of NXP Semiconductors; Materialise: Joined in 2010 for the cranio-maxillofacial business, in 2012 became the Director of the Clinical Business Unit and in 2015 was VP & General Manager of MTLN Software;
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Brigitte de Vet-Vei
Education: Master in Business Administration majoring in Engineering; Experience: VP at Cordis Neurovascular and GM. Became CEO of Acertys group (provider of medical devices and software); Materialise: Joined in 2016 in representation of De Vet Management BVBA as a VP for the Medical segment;
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Jurgen Laudus
Education: Master in Engineering; Materialise: Joined in 2001 as a project manager, Rapid Tooling sales support and production management, International Production Manager for the AM services and Sales Manager. Became VP of the manufacturing segment;

EXECUTIVE COMMITTEE

Name	Age	Gender	# years at Materialise NV	Position
Wilfried Vancraen	58	Male	30	Founder, Director & CEO
Peter Leys	55	Male	7	Executive Chairman
Hilde Ingelaere	58	Female	30	Director & Executive VP - Medical
Johan Pauwels	52	Male	30	Executive VP - Software
Bart Van der Schueren	53	Male	25	Executive VP & CTO
Johan Albrecht	56	Male	5	Executive VP & CFO
Stefaan Motte	43	Male	10	VP & Materialise Software segment
Brigitte de Vet-Veithen	49	Female	4	VP & Materialise Medical segment
Jurgen Laudus	41	Male	19	VP & Materialise Manufacturing segment
Eduard Crits	61	Male	2	CIO
Conny Hooghe	54	Female	3	VP & Human Resources
Carla Van Steenberghe	44	Female	17	VP & CLO

BOARD OF DIRECTORS (BOD)

Name	Age	Gender	# years at Materialise NV	Position
Wilfried Vancraen	58	Male	30	Founder & CEO
Peter Leys	55	Male	7	Executive Chairman
Johan De Lille	57	Female	14	Independent Director
Hilde Ingelaere	58	Female	30	Director & Executive VP - Medical
Pol Ingelaere	84	Male	9	Independent Director
Jurgen Ingels	49	Male	7	Independent Director
Jos Vander Sloten	57	Male	13	Independent Director
Lieve Verplancke	60	Female	5	Independent Director
Bart Luyten	43	Male	3	Independent Director
Volker Hammes	56	Male	2	Independent Director

Source: Web page

Company & Market Overview

Value Creation & Business Plan

Exit & Returns

Exit Options & Due Diligence

Market Overview

Political

- 3DP requires great political intervention as it could threaten public safety. Governments may have to control the scattering of 3D printers by developing a database with all the holders and assigning an ID number to each printer.
- Government may also have to intervene in order to prevent the production of **contraband** that could lead to the creation of black markets.
- Finally, another issue that requires political intervention is the 3D printing of designs that have **intellectual property rights**.

Economic

- Given the current economic outlook, **subsidies and grants** for research and development are likely to fall, which will surely impact the 3D printing market.
- Likewise, **taxation** is expected to rise in the overall economy both direct and indirect.
- Finally, the private sector will also face great challenges accessing **debt markets** at reasonable conditions.

Social

- 3D printing allows people to run their production in any part of the world. This will create **pressure on the “traditional” manufacturing market** as there is great concentration of production and employment in industrial regions.
- The rising trend for the use of **social networks** may play a crucial role in the evolvement of 3D printing. People will want to share their own customized 3D printed designs with friends, family and society as if they were sending photos or videos.

Technological

- 3D printing is considered a **disruptive technology** in the manufacturing market, as it allows for the production and sharing of customised products and designs.
- However, the 3D printing market has **not yet reached its peak** or maturity, as new technologies arise allowing people to model even more their designs and use different materials.

Legal

- The 3D printing market highly relies on **intellectual property (IP)**. Manufacturers and software designers are protected by patents for a limited number of years. However, with the growth of the 3D printing market new legislation will be required.
- As it was mentioned in the political factors, the breach of IP rights and contraband production are issues that put constrains on the development 3D printing market and that call for heavy legislation.

Environmental

- When it comes to **mineral resource consumption** and **water waste**, 3D printing is considered more sustainable than the traditional industrial manufacturing process.
- On the other hand, researchers claim that the 3D printing process has high **energy demands**, which can contribute to the emissions of Greenhouse Gases (GHG’s).

<https://corporatefinanceinstitute.com/resources/knowledge/strategy/pestle-analysis/>
<https://sites.google.com/site/headinthecloudsconsultancy/pestle-analysis>

Historical Financials | Income Statement

Income Statement (in €m)	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19
Software	11	13	18	26	30	36	37	42
Medical	25	28	30	35	38	43	52	61
Manufacturing	23	27	33	41	46	64	95	94
Total Revenue	59	69	81	102	114	142	185	197
Growth %	-	17%	18%	25%	12%	24%	30%	7%
Gross Profit	35	42	49	59	68	80	102	110
Gross Margin %	60%	60%	60%	58%	59%	56%	55%	56%
Research and development expenses	(9)	(11)	(15)	(18)	(18)	(20)	(22)	(23)
Sales and marketing expenses	(20)	(22)	(28)	(37)	(36)	(39)	(46)	(53)
General and administrative expenses	(8)	(9)	(12)	(15)	(20)	(25)	(32)	(32)
EBITDA (unaudited)	5	8	5	3	8	13	22	26
Adjustments to EBITDA	0	0	1	1	1	2	1	0
Normalized EBITDA (unaudited)	5	8	6	4	9	15	24	27
EBITDA margin %	9%	11%	7%	4%	8%	10%	13%	14%
Net profit	1	3	2	(3)	(3)	(2)	3	2
Profit Margin %	2%	5%	2%	-3%	-3%	-1%	2%	1%

Comments

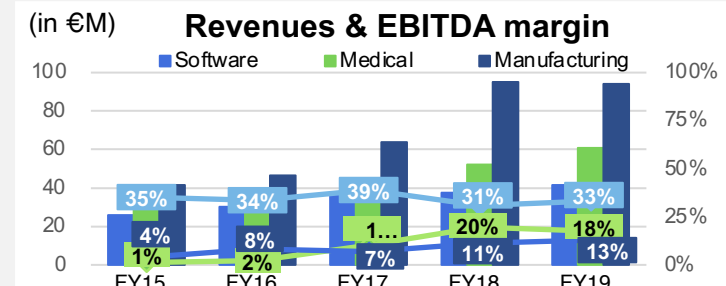
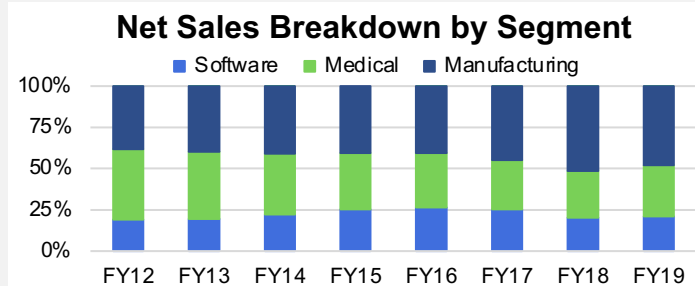
The Medical Segment revenue growth from FY17-18 was entirely due to an increase in partner sales, especially in the business lines of CMF, shoulder and knee devices. From FY18-19, the acquisition of **Engimplan** contributed with **€2.4m additional revenue** and while observing continued growth from partner business sales (especially CMF).

The acquisition of **ACTech** resulted in **€43.4m additional revenue** from the sale of printed industrial and consumer products, causing the manufacturing segment to weigh 51.4% of revenues compared to 44.7% in FY17.

The stagnation of growth in manufacturing revenues due to a less favorable economic scenario in FY19 (i.e. trade war) broke the revenue trend, although partially offset by increases in other segments.

Increase in costs mainly reflect the acquisition of ACTech. Increasing operation costs mainly driven by S&M and G&A expenses, both largely composed by payroll expenses.

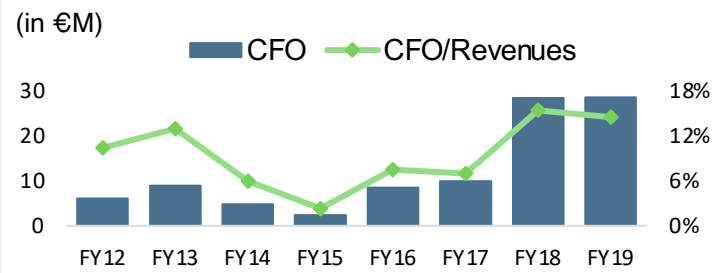
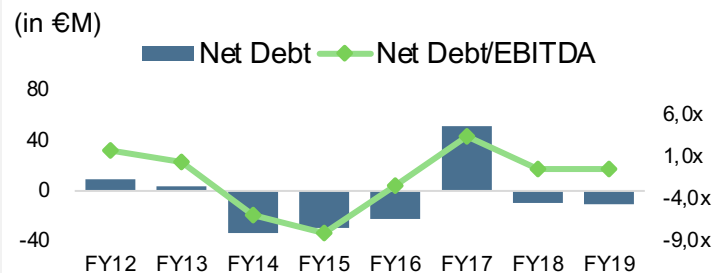
Materialise reaches profitability after increases in revenues from ACTech more than offset increase in costs.



Historical Financials | BS & CFS

Balance Sheet (in €m)	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19
Cash and Cash Equivalents	6	13	51	51	56	43	116	129
NWC w/ Cash	4	7	53	46	48	35	96	107
Equity	13	18	85	83	79	77	136	143
Net Debt	9	4	(34)	(30)	(22)	51	(9)	(11)
<i>Net Debt/EBITDA</i>	2x	0x	-6x	-8x	-2x	4x	0x	0x
<i>ROE</i>	11%	19%	2%	-3%	-4%	-3%	2%	1%
<i>ROA</i>	3%	6%	1%	-2%	-2%	-1%	1%	0%

Cash Flow Statement (in €m)	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19
Normalized EBITDA	5	8	6	4	9	15	24	27
Income tax paid	0	0	(0)	(0)	(1)	(2)	(1)	(2)
CFO	6	9	5	2	8	10	28	28
Purchase of PPE	(4)	(2)	(10)	(9)	(12)	(28)	(18)	(13)
Acquisition of Subsidiary (net of cash)	0	(0)	(10)	(2)	0	(27)	0	(6)
CFI	(5)	(3)	(31)	(3)	(13)	(59)	(22)	(26)
Net Proceeds of Loans & Borrowings	3	1	(1)	1	12	42	14	17
Capital Increase in Parent Company	(1)	0	70	1	0	0	60	1
CFF	2	1	62	(2)	9	38	65	11
<i>CFO/Revenues</i>	10%	13%	6%	2%	7%	7%	15%	14%
<i>CFO/Assets</i>	13%	16%	4%	2%	5%	4%	9%	8%
<i>CFF/CFO</i>	39%	8%	1282%	-76%	109%	382%	230%	38%



Comments

1 In June 2014, Materialise went public and sold around 8 million ADS's at a price of \$12.00 per ADS. According to Materialise's financial reports, the company received net proceeds from the **IPO** of approximately \$88.3M.

2 In July 2018, MTLs closed a **private placement** of around 2M ordinary shares to BASF Antwerpen. One week later the company performed a **secondary public offering** of over 3M ADSs at a price of \$13.00 per ADS. Collectively, these capital increases rendered approximately \$65.2M in net proceeds for MTLs.

3 Usually in possession of more cash & eq. relative to its financial obligations, we can see a temporary switch in 2017 given a major increase in Loans & Borrowings to fund ACTech (€27.2M) and PPE (€27.7M).

4 In 2014, MTLs acquired **OrthoView**, an Orthopedic Pre-Operative Planning Software Co. In 2017, acquired **ACTech**, full-service manufacturer of complex metal parts. On August 2019, Materialise concluded the acquisition of **Engimplan**, a Brazilian company specialized in manufacturing of orthopaedic and CMF implants and instruments.

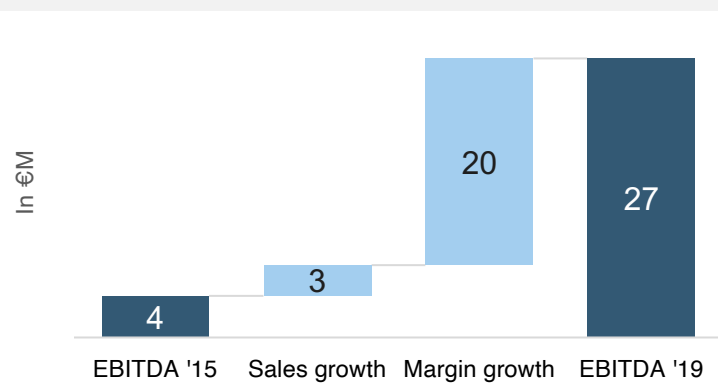
5 This increase in Loans & Borrowings reflect the financing of ACTech's acquisition, expansion of PPE and R&D projects.

Sources: Annual Report, Investor Relations

Historical Financials | FCF

CAPEX (in €M)	FY15	FY16	FY17	FY18	FY19	Free Cash Flow (in €M)	FY15	FY16	FY17	FY18	FY19
Purchase of PPE	(9)	(12)	(28)	(18)	(13)	EBITDA	4	9	15	24	27
Proceeds from of PPE & intangibles	0	2	0	0	0	Depreciation & Amortization	(7)	(8)	(13)	(17)	(19)
Purchase of intangible assets	(2)	(2)	(4)	(2)	(2)	EBIT	(3)	1	2	6	7
Acquisition of subsidiary (net of cash)	(2)	0	(27)	0	(6)	Operating Taxes	0	(2)	(1)	(0)	(3)
CAPEX	(12)	(13)	(59)	(20)	(22)	Maintenance CAPEX	(7)	(8)	(13)	(17)	(15)
Maintenance	(7)	(8)	(13)	(17)	(15)	Expansion CAPEX	(5)	(4)	(46)	(3)	(6)
Expansion	(5)	(4)	(46)	(3)	(6)	Change in NWC	1	2	(7)	10	3
						FCF	(6)	(3)	(52)	13	5

EBITDA Growth



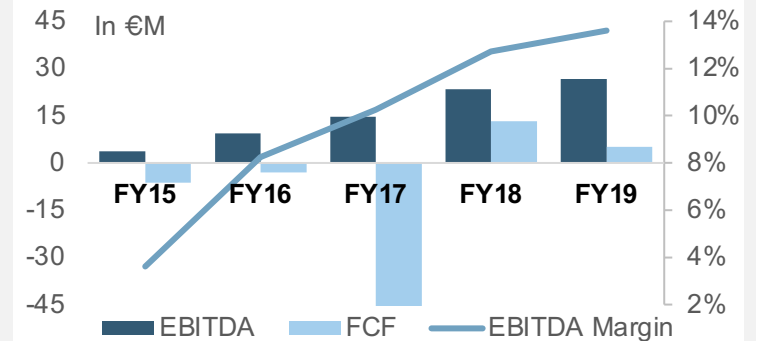
1 EBITDA experienced a constant growth since 2015 with a **CAGR of 73%**. The rise in EBITDA is mainly explained by the **EBITDA Margin improvement** and a smaller part driven by revenue growth.

CAPEX & NWC

2 In 2017 Materialise acquired ACTech, a German full-service manufacturer of complex metal parts, for a total of €28M in cash. This acquisition led to a drastic change in the expansion CAPEX and consequently a very negative FCF in 2017 of around €52M.

3 The Net Working Capital has been changing steadily over the period of 2015 to 2019. These changes are mainly explained by the acquisitions and strategic partnerships that Materialise established over the past few years. Not only ACTech in 2017 but also Engimplan in 2019.

Free Cash Flow

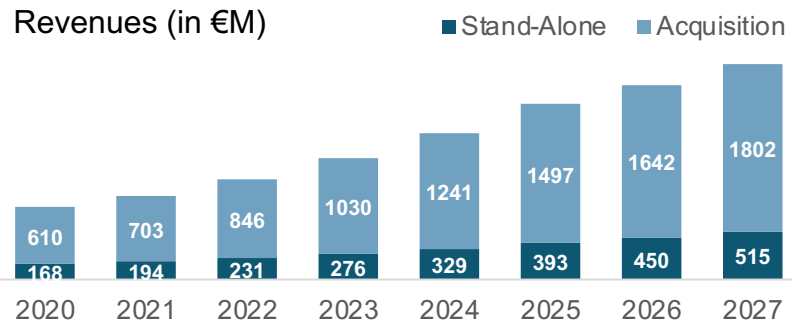


4 The FCFs have been unstable mainly due to the CAPEX, which includes acquisitions of subsidiaries. However, since 2018 the cash flows have been increasing driven by the EBITDA growth.

Sources: Annual Report, Investor Relations

Business Model | Overall Business Plan

Top Line



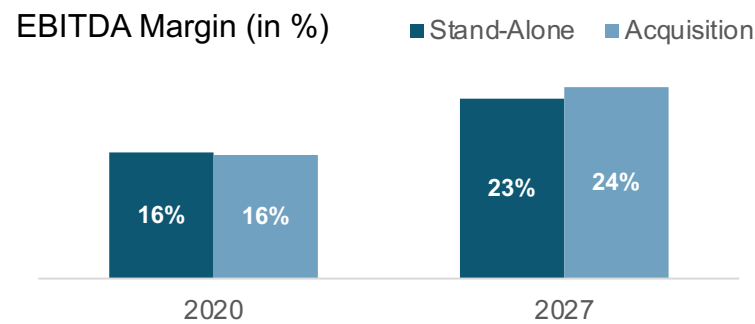
1 Standalone Scenario

Increasing focus in the **APAC** and **US** regions by engaging in strategic partnerships. Special focus in Workflow & CAD Software, in order to enable customized mass-production. Expand the offer of **metal-based printing**, key growth area with increasing demand in the AM industry. In terms of revenues, the period 2020-2027 has a **CAGR of 17.3%**.

2 Acquisition Scenario

This growth can be explained by the revenue synergies arising from the vertical and horizontal integration of Stratasys into Materialise's business. Post-acquisition the company becomes an **all-in-one supplier** which allows for the target of a larger customer base. In terms of revenues, the period 2020-2027 has a **CAGR of 16.7%**.

Bottom Line



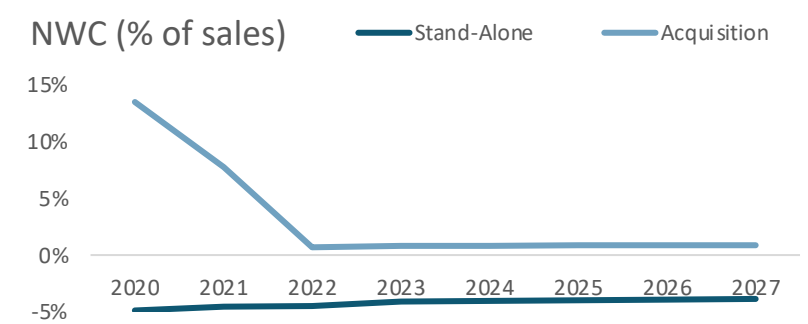
1 Gross Margin (GM)

Materialise already possesses a strong GM when compared to its top competitors. In 2019 Materialise's GM was 61% while Stratasys had a GM of 49%. Post-acquisition, Materialise's **operational efficiency** will contribute to the improvement of Stratasys margins. In addition, the company will also benefit from a **higher bargaining power** with suppliers.

2 EBITDA Margin

In the Stand-Alone scenario Materialise is expected to be able to improve its EBITDA margin at a **CAGR** of **5.2%** between 2020 and 2027. With the acquisition of Stratasys, the company will benefit from **R&D and SG&A synergies**, mainly in the Service Provider segment. This will result in a **CAGR** of around **6.4%** of the EBITDA margin between 2020 and 2027.

Investments

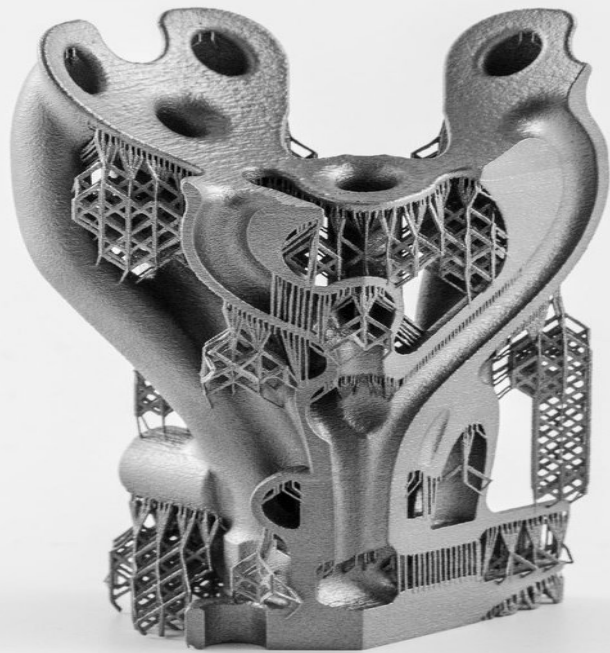


1 Net Working Capital (NWC)

In 2019, Materialise's **NWC** was **-4%** of revenues, meaning a quick generation of cash from operations, while Stratasys had **32%**. Post-acquisition, the company will hold a stronger bargaining power with its customers and suppliers. In the acquisition scenario, from 2020 to 2022 the NWC will fall steadily, until it remains constant at around 1% from 2022-onwards.

2 CAPEX

In the stand-alone scenario CAPEX will slightly decrease from 8% to 3% of sales until 2027. In the acquisition scenario, the CAPEX will require **larger investments** in order to streamline operations across countries. On the other hand, there will also be **divestures** in the geographical areas where both companies are present.



Individual Paper

Investment Thesis | Deal Rationale

Deal Rationale

Strong competitive positioning	<ul style="list-style-type: none"> ▪ A pioneer and global leader in 3D printing, Materialise has the necessary tools to benefit from the expected market growth in this disruptive industry. ▪ It's expertise, global reach and presence in key segments are the necessary ingredients to set the company up for success.
Successful acquisition history	<ul style="list-style-type: none"> ▪ With 6 acquisitions in the past decade, the company has been able to streamline its operations, successfully integrate different businesses and construct a reliable supply chain. ▪ The company has successfully entered new markets and diversified the economic cycle risk in the markets it operates in.*
Market with strong growth prospects	<ul style="list-style-type: none"> ▪ 7-Year CAGR estimates vary between 18% - 27% for the overall AM industry, with research reports indicating a strong uptrend in technology adoption for several industries around the globe. ▪ With AM becoming mainstream, large-scale production will become crucial and Materialise's expertise in workflow software will prove essential.
Strong financials	<ul style="list-style-type: none"> ▪ Liquidity-wise, current and quick ratios sit above 2.0x. ▪ Long-term solvency, in terms of debt analysis, are also healthy with an uptick in debt recently, relating to 2017 and 2019's acquisitions. ▪ The company has managed to increase profitability and operating efficiency despite ongoing expansion projects.
Highly skilled workforce	<ul style="list-style-type: none"> ▪ Engineering top knowledge has been integral to the business, enhancing software development and 3D printing expertise, especially regarding industrial and medical applications. ▪ Human resources are an essential source of competitive advantage to provide innovative products and processes to penetrate complex markets.

Value Creation Plan – Main Goals

A. Organic Growth

- Increasing focus in APAC and EMEA through strategic partnerships and investments in new PP&E. Initiatives such as *Made in China 2025* will help boost AM adoption, hence strengthening our already established presence is key to ensure that Materialise is well positioned to have a key role in this region.
- Focusing on our offer of metal-based printing, a key area of growth in the Additive Manufacturing industry.

B. Optimizing Operations

- High attrition rate in the work force – expenditures on personnel and training are above industry averages.
- Establishing new Sales and Marketing initiatives that are in line with our internationalization goals, consequently reducing efforts in already saturated regions, such as central Europe.
- Current and Quick ratios suggests the company can use its cash more efficiently than it is at the present.

C. Strategic Acquisition: Vertical Integration

- The acquisition of a system manufacturer will help enhance the company's position along the value chain and potentially reduce machine purchasing costs for several types of technologies.
- The combination of software and hardware will provide new room for personalized machines with Materialise's built-in software, potentially increasing efficiency, workflow and productivity.
- With the increasing shift of production methods from traditional manufacturing processes to 3DP, this strategy will provide Materialise with a strong competitive advantage as consumers will only have to address one seller, initially for production services and eventually to purchase the machines directly.

Source: Fern Fort University, Annual Report

Company & Market Overview

Value Creation & Business Plan

Exit & Returns

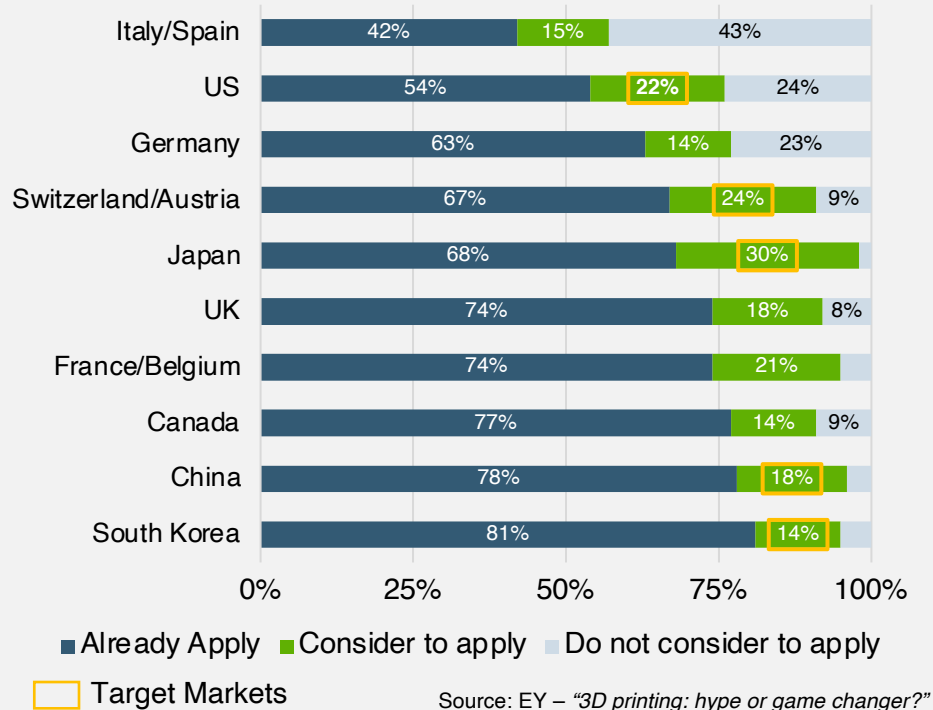
Exit Options & Due Diligence

Strengthen Global Presence

Objectives

- Addressing geographical trends in emerging markets and working towards a **first-mover advantage** in the APAC region.
- Focusing on markets with potentially high adoption rates.¹

Experience of AM technologies per country 2019



Method

- Channeling Sales & Marketing (S&M) efforts more efficiently towards **Austria, Switzerland, APAC and the US**. In practice, specialized teams will be formed to deliver pitches about our product-offerings to companies which were beforehand identified as potential customers.
- **Investing over €28m in new offices** and production sites to increase our PP&E by roughly 20% (in square ft.) over the course of 7 years, representing:
 - ~ **€11m** being directed towards efforts in the APAC region with new sales offices in **China, South Korea and Japan**.
 - ~ **€10m** spent in a new production office in **Austria** to address market trends in this area.
 - ~ **€6m** in new offices and warehouses spent in the **US in 2024**, to keep up with growing demand in the region.
- Continue developing **strong partnerships through co-creations** with local companies to increase customer base and **penetrate local markets**. Existing collaborations with global players such as Siemens, Abbott Laboratories, or Johnson & Johnson, will also be crucial in getting a foothold in underserved regions.

Expectations

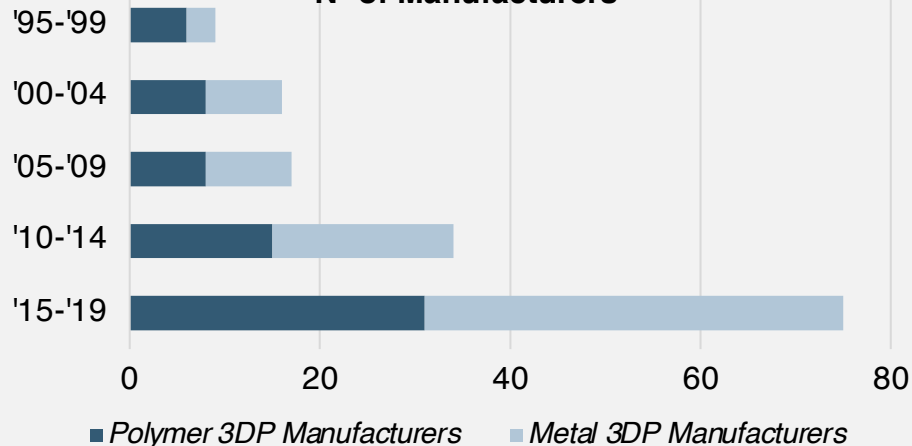
- Ensuring that Materialise is prepared for the increased technology adoption in these regions, which will consequently boost **top-line growth**.
- Creating an **international, diversified streamlined value chain** which will likely result in lower production costs, higher bargaining power and less exposure to country-specific risks.
- A fine-tuned S&M strategy that can increase Materialise's competitive ability.

Focusing on the future

Objectives

- Continue developing software that enables **personalized mass-production**, potentially transforming the Manufacturing industry by providing design flexibility.
- Increasing capabilities on **metal-based printing**.

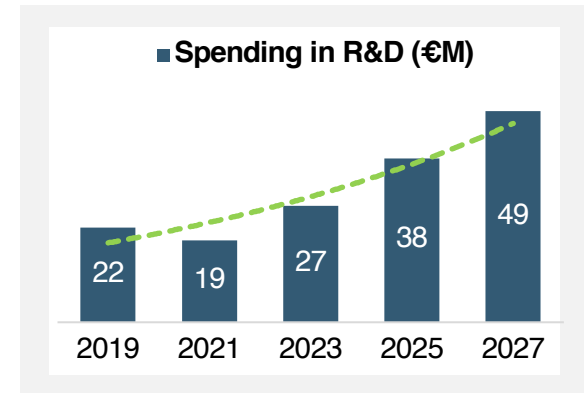
N° of Manufacturers



- With the exponential rise in the number of hardware manufacturers observed throughout the past years, the **demand for sophisticated industrial-grade systems is on the rise**. This is a consequence of manufacturers wanting to scale their 3D printing expertise with a workflow software that can manage production.

Method

- Continue increasing R&D investment efforts (nearly doubling in 5 years), with a special focus towards **workflow & CAD software** development that allows for more centralized and automated production processes, which are highly demanded in the market.
- Additionally, ensuring that the ongoing efforts, such as:
 - The various development projects related to engineering and designing (i.e. handling large amounts of data);
 - Improving maturity, reliability and quality of AM processes.
- Investing in **metal-based technologies** such as machine integration while diverting sales & marketing software vending efforts to metal producers, which have increased two-fold in the past decade.
- Constructing a new R&D Lab in Japan (>€6M) to develop APAC-focused software in order to address specific customer needs that are particular to this region.



Expectations

- Boosting significantly software top-line growth and increasing subscriptions by **tapping into the manufacturing market's** need for automation and workflow software.
- Addressing market trends and establish key partnerships in **metal-based printing** with players such as Desktop Metal, HP, Stratasys, etc.

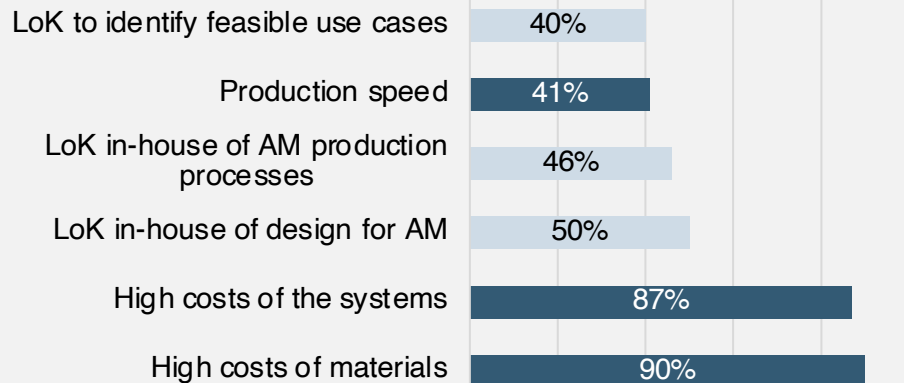
Sources: EY Global 3DP survey 2019; AMFG; Annual Report

Optimizing Performance

Objectives

- **Decreasing operating costs** which have been hindering profitability.
- **Minimize the knowledge gap¹** of consumers in the AM industry.
- **Focusing on high-margin** end-markets.

Most common barriers to entry for consumers in 3DP



*LoK = Lack of knowledge

Source: EY – “3D printing: hype or game changer?”

- The lack of capability and know-how has proven to be a major obstacle for an increased adherence to AM solutions. In addition, high costs have also been setting back the adoption of this technology but are expected to decrease as the market becomes more competitive overall.

Method









- **Tweaking our efforts towards the software segment**, which is expected to have a 10% increase in revenue shares over a period of 7 years, in order to boost bottom-line growth.
 - Open systems, which allow for more personalization, pose a threat to closed systems such as the ones Materialise provides*. This will require **intensive efforts to increase the personalization of closed systems** without losing the quality and reliability which is characteristic to them.
 - In turn, this might result in a different product-offering, potentially with tighter profit margins, that addresses these customers demands, with models like what 3D Systems already supplies.
- Training our sales teams to **address potential customers who have no knowledge** about the AM industry, which represent from 44% to 61% of companies across the globe, according to multiple reports.
- Decreasing operating expenses mainly through **cost-cutting in the sales force**, retaining only what is necessary for business and for our marketing plans previously explained.

Expectations

- **Creating a precise and focused marketing approach**, connecting less experienced customers to AM technology.
- **Balancing** our revenue mix, reflecting our plans for future operations, and addressing the current barriers to entry that customers face without compromising bottom-line growth.

Source: Sculpteo, EY Global 3DP survey 2019; Annual Report

Investment Thesis | Potential Targets | C - Strategic Acquisition (1/3)

	Stratasys	3D Systems	ExOne	SLM Solutions
Profile	<p>Incorporated in 1989, Stratasys is headquartered in Israel and Minnesota. Went public in 1994 and today has a market cap of \$691.93M and over 2,400 employees.</p> <p>Leading hardware manufacturer (HM) and well-established service provider of 3D printing solutions. Focuses on the production of SLA, FDM and PJ printers. Works with plastic and composite materials.</p>	<p>Incorporated in 1983, 3D Systems is headquartered in Delaware, US. Went public in 2011 and today has a market cap of \$707.47M and over 2,500 employees.</p> <p>Leading hardware manufacturer and well-established software vendor and service provider. Focuses on the production of SLA, SLS, DMP and CJP printers. Works with plastic, metal, wax, ceramic and composite materials.</p>	<p>Incorporated in 2005, ExOne is headquartered in Delaware, US. Went public in 2013 and today has a market cap of \$186.05M and over 300 employees.</p> <p>Hardware manufacturer, material supplier and service provider of 3D printing solutions. Focuses on the production of Binder Jetting (BJ) printers. Works with metals, ceramics, sand and composite materials.</p>	<p>Incorporated in 2006, SLM Solutions is headquartered in Lubeck, Germany. Went public in 2014 and today has a market cap of \$220.35M and over 400 employees.</p> <p>Global hardware manufacturer with special focus on metal additive manufacturing. The company produces Direct metal Laser Sintering (DMLS) printers. Works with almost every type of alloy, including aluminium and titanium.</p>
Financials	<p>Revenues FY19 (€M) ----- 566</p> <p>Gross Profit FY19 (€M) ----- 279</p> <p>Gross Margin FY19 (%) ----- 49%</p> <p>EBITDA FY19 (€M) ----- 35</p> <p>EBITDA Margin FY19 (%) ----- 6%</p>	<p>Revenues FY19 (€M) ----- 560</p> <p>Gross Profit FY19 (€M) ----- 247</p> <p>Gross Margin FY19 (%) ----- 44%</p> <p>EBITDA FY19 (€M) ----- (6)</p> <p>EBITDA Margin FY19 (%) ----- -1%</p>	<p>Revenues FY19 (€M) ----- 47</p> <p>Gross Profit FY19 (€M) ----- 16</p> <p>Gross Margin FY19 (%) ----- 33%</p> <p>EBITDA FY19 (€M) ----- (9)</p> <p>EBITDA Margin FY19 (%) ----- -20%</p>	<p>Revenues FY19 (€M) ----- 49</p> <p>Gross Profit FY19 (€M) ----- 24</p> <p>Gross Margin FY19 (%) ----- 49%</p> <p>EBITDA FY19 (€M) ----- (26)</p> <p>EBITDA Margin FY19 (%) ----- -53%</p>
Rationale	<p>Entrance in the HM market through a leading player in the industry with strong financial margins. Revenue growth in the services segment and a key supplier of 3D printers for Materialise. Strengthen positions in the Americas and APAC region.</p> <p> </p>	<p>Entrance in the HM market through a leading player in the industry. Revenue growth in the services segment and one of Materialise's main suppliers of 3D printers. Strengthen positions in the Americas and APAC region.</p> <p> </p>	<p>Entrance in the HM market through a player well-established in Europe, but with weak margins. Revenue growth in the services segment and a supplier of BJ printers for Materialise. Focuses mainly on the EMEA region, low geographic outreach.</p> <p> </p>	<p>Entrance in the HM market through a leading player in Europe, but with very weak margins. Revenue growth in the services segment and key supplier of metal 3D printers for Materialise. Strengthen position in the APAC region, but limited geographic outreach.</p> <p> </p>

Source: Company's Annual Reports

Company & Market Overview

Value Creation & Business Plan

Exit & Returns

Exit Options & Due Diligence

Company Description



Stratasys is one of the largest hardware manufacturers in the 3D Printing Industry and is a leading provider of applied AM solutions for the automotive, aerospace, consumer products, healthcare and education industries.

Founded in 1989, Stratasys is headquartered in Israel and Minnesota. The company went public in October 1994, being listed in the Nasdaq, valued at \$5.7M at the time of the IPO. It merged with 3D printer manufacturer Objet Ltd in 2012, bought MarketBot (provider of desktop 3D printers) in 2013 and Solid Concepts and Harvest Technologies (3DP services provider) in 2014.

Stratasys has set the market's pace being pioneer in FDM and Poly-Jet technologies.

- Industry: Hardware
- Market Cap: \$ 691.93M
- Employees: # 2,400
- Patents; 1,000 (& 500 pending approval)
- Brands: Stratasys Direct Manufacturing, Blueprint Consulting, GrabCad design and MarketBot;

*See Appendix 11 for a more detailed financial overview

Product Offerings

Hardware 3D printers

FDM® Printers: facilitate end-to-end fast prototyping, tooling and preparation of jigs and fixtures – 8 models;

PolyJet™ Printers: enables printing several materials including multiple colours and textures in a single part build – 13 models;

Stereolithography Printers: enables producing in large scale with the ability to fine-tune the production of parts, prototypes and tools – 1 model;

Consumable Materials

Stratasys offers materials for the buyers of their 3D printers on an ongoing basis, (recurring revenue stream). They have 45+ **PolyJet** cartridge based resins (produced in-house), 60+ **FDM** spool based filament materials, 158 non-colour digital materials & 500,000+ colour variations;

Software

GrabCAD Print: free service that enables scheduling, monitoring & analysing workflow, connecting multiple printers simultaneously;

GrabCAD Shop: enables order management for 3DP shops which have many different complex requests;

Online Community

Thingiverse.com: free online platform to share downloadable 3D designs;

GrabCAD Community: meant for engineers, designers and manufacturers to have discussion forums, download & upload free CAD files, etc;

Service Offerings = Manufacturing segment (Materialise)

Support Services & Warranties

Customer Support: On-site installation, user training, maintenance & repair services and technical support; Warranties and leasing services;

Stratasys Blueprint Consulting

World leading AM consultancy that provides services to companies that are "future ready" and wish to start using Additive Manufacturing in their production processes;

SDM paid-parts service

Stratasys Direct Manufacturing is the service provider arm of Stratasys that produces plastic or metal prototypes and end-use parts for customers;

FY19's Highlights

Revenues
€ 566M

Products Share
67.7%

Services Share
32.3%

Growth rate
-3%

EBITDA
€ 49M

EBITDA mg
6%

Source: Stratasys' web page

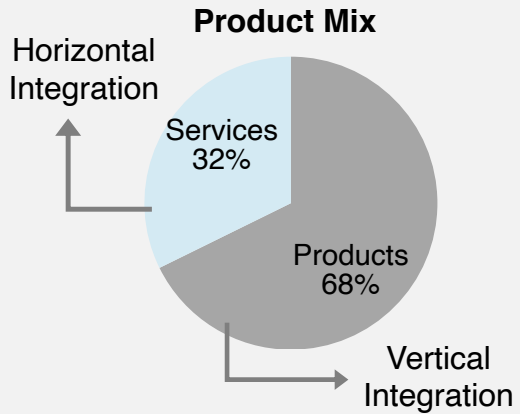
Company & Market Overview

Value Creation & Business Plan

Exit & Returns

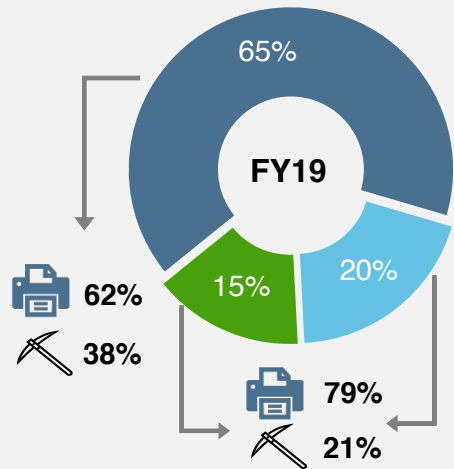
Exit Options & Due Diligence

Appendix 11 | Company Overview | Stratasys's financials



Revenues by Geography

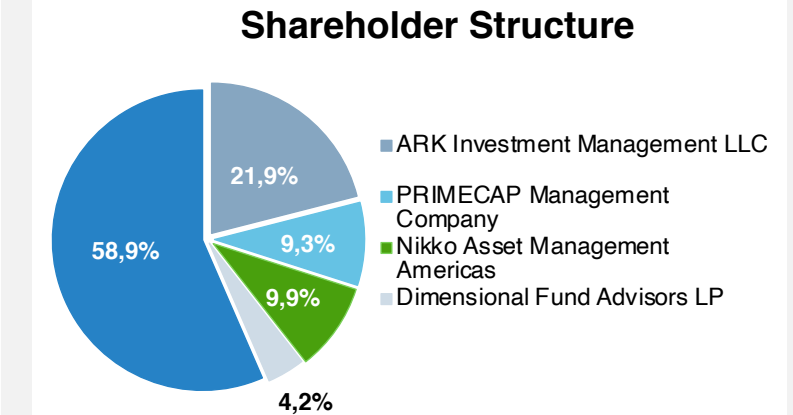
- Americas
- EMEA
- Asia Pacific



Key Statistics M€	FY15	FY16	FY17	FY18	FY19
Total revenue	633	639	561	584	566
COGS	(540)	(337)	(290)	(297)	(287)
Gross profit	93	301	271	286	279
SG&A	(111)	(93)	(81)	(87)	(84)
R&D	(396)	(292)	(216)	(207)	(206)
EBITDA	(329)	20	30	46	35
Net Profit/(Loss)	(1 250)	(74)	(34)	(10)	(10)

	FY15	FY16	FY17	FY18	FY19
Gross margin	15%	47%	48%	49%	49%
Products	7%	51%	54%	55%	58%
Services	34%	38%	35%	35%	32%
SG&A/ Sales	(18%)	(15%)	(14%)	(15%)	(15%)
R&D/ Sales	(62%)	(46%)	(38%)	(35%)	(36%)
EBITDA margin	(52%)	3%	5%	8%	6%
Net margin	(197%)	(12%)	(6%)	(2%)	(2%)

	FY15	FY16	FY17	FY18	FY19
Total Assets	1 287	1 298	1 159	1 222	1 230
Total Liabilities	203	217	206	216	199
Total Equity	1 082	1 079	951	1 005	1 030
Solvency ratio	84%	83%	82%	82%	84%
Net Debt / Equity	(19%)	(20%)	(23%)	(30%)	(20%)
NOCF	(20)	59	52	56	(10)
CF Investing	(85)	(61)	(23)	6	(62)
CF Financing	(61)	25	9	(3)	(20)
Net Δ in Cash	(168)	22	41	57	(89)



Top Management

Name	Age	# years at Stratasys	Position
Elchanan Jaglom	78	6	Chairman of the Board of Directors
S. Scott Crump	66	31	Founder & Chairman of the Executive Committee & Chief Innovation Officer
Victor Leventhal	75	8	Director
John J. McEleney	57	13	Director
Dov Ofer	65	3	Director
Ziva Patir	69	7	Director
David Reis	59	11	Vice Chairman of the Board of Directors and Executive Director
Yair Seroussi	64	3	Director
Adina Shorr	59	7	Director
Yoav Zeif	53	1	Chief Executive Officer
Lilach Payorski	46	5	Chief Financial Officer

Source: Stratasys' Annual Report

Strategic Approach



+



- Creating an **end-to-end platform**, which is currently lacking supply in the market. Developing an **all-in-one package** of software and hardware will not only allow for further personalization but also improve customer experience through more efficient assistance.
- **Tackling more efficiently the knowledge gap** as consumers will only have to address **one supplier** to cover the whole procedure behind the implementation of 3DP in their companies.



+



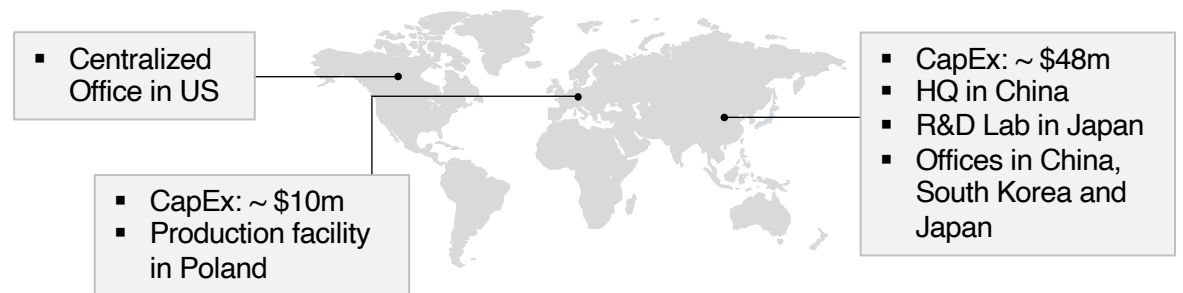
- **Combining R&D efforts** and syncing them with our strategic plan, while focusing on maintaining a strong and complete Intellectual Property portfolio.
- Facilitate **investment in highly specialized products** that would otherwise be riskier without vertical integration.
- Developing a **customer network** across the globe to facilitate cross-selling in different regions.
- **Marketing plans** to introduce new products to existing customers.



- **Strengthening our global presence** in the Americas and Middle East, where Stratasys currently has a strong position.
- Extending the company's position along the value chain and **partially eliminate supplier risk**, ultimately leading to improvements in inventory management regarding FDM and PolyJet technologies.
- Potentially reducing input costs through the increased bargaining power while **improving supply chain coordination**.

Execution and Results

- Ideally merging Stratasys' GrabCAD software with Magics over time and **creating a unique software solution** that offers the best of both. Otherwise, maintaining both solutions while **decreasing switching costs** to provide more flexibility for the customer.
- Combining both company's respective competitive advantages in each market to design an **end-to-end solution** that can fully replace existing production processes in order to facilitate transitions to 3DP solutions.
- **€100m average yearly spending on R&D** efforts. Concentrating all R&D operations in the US to maximize development synergies while opening a new R&D Lab in Japan that will address the APAC market.
- In addition to the Sales and Marketing plan set for the standalone scenario, there will be an implementation of **specialized teams** in initial post-acquisition years **to promote cross-selling** to existing customers, with the goal of generating topline synergies across business units.
- The G&A team will help develop a customer targeting plan in the initial years.



Sources: Investor Relations Materialise; Annual Reports

Individual Reflection

The Covid-19 pandemic has had a profound impact across all businesses and geographies, in such a way that the world has readapted and the idea of a "new normal" has emerged. Despite the hazards that the lockdowns created, the closing of borders which led to trade and supply chain disruptions, the uncertainty regarding the future which led markets to look very bearish, the shutdown of many businesses and the spike of unemployment, as well as the health concerns that limited social contact to a minimum, the additive manufacturing market was hindered like all others but will thrive as a result of 2020's events.

In fact, in a time when adaptation of business models was crucial for survival and flexibility and speed of production was key, the 3D printing market surged as an answer as it could easily adjust to producing anything that was needed in a timely manner. Consequently, even if the AM industry was still impacted by shortages in labor force and in necessary materials, companies like Materialise, Stratasys, 3D Systems, ExOne, Protolabs and others, especially in the service providing sphere, stepped up to facilitate the combat against the Covid-19 pandemic. These companies became large producers of face masks and shields, nasal swabs, protective gear for healthcare professionals, critical medical devices for ventilators and others, as well as life helpers like hands-free door openers, shopping carts handlers, etc, that contribute to everyone's safety. They capitalized on their healthcare expertise and network to strengthen their presence and gain further importance within the market, seizing the existing momentum.

Furthermore, as general manufacturing companies faced turmoil in their production processes, the adoption of 3D printing as a way to substitute certain suppliers that were having production shortages became a solution. As so, the usage of 3D printing services became widely spread, thus boosting these AM companies' exposure to a larger spectrum of customers, which is believed to push the overall market to have a higher penetration post Covid-19 times. As an increasing number of companies had a first experience using this unconventional production method, the technological inhibitions usually undergone are now substantially decreased, being more prone to moving towards the permanent usage of 3D printing in their regular production processes.

Additionally, the market became increasingly aware of the benefits of incorporating 3D printing processes in traditional manufacturing as it maintains the quality, durability and material strength of products, being able to be produced rapidly, in a customized way to satisfy almost every need. As a result of the positive outlook and investors expectations of what this industry can become, there was a overall rise in stock prices during the year across the entire AM market. Like many technological companies, Materialise's stock grew by 202%, Stratasys' by 16%, 3D Systems' by 36%, ExeOne's by 63% and Protolabs' by 88%.

Overall, the additive manufacturing market was strongly impacted by the Covid-19 pandemic, initially as all industries were, but it managed to turn this into a positive shock. By being a first mover in the production of must needed healthcare products and stepping in for those with supply chain disruptions, 3D Printing companies enabled the expansion of its customer base by introducing this production method to a large range of customers. Consequently, it is expected that even though Covid-19 reduced production for AM related companies in FY20 due to shortages in materials and others, it heightened the penetration of the industry itself to manufacturing companies worldwide.

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