

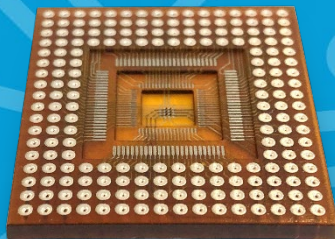


NANODIMENSION

Electrifying Additive Manufacturing®

# 3D-PRINTED ELECTRONICS ADDITIVELY MANUFACTURED ELECTRONICS (AME)

Corporate Presentation | Nasdaq: NNDM | **June 9<sup>th</sup>, 2021**



Intelligent Machines, Consumable Conductive & Dielectric Ink Materials

# Forward Looking Statements

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*This presentation of Nano Dimension Ltd. (the “Company”) contains “forward-looking statements” within the meaning of the Private Securities Litigation Reform Act and other securities laws. Words such as “expects,” “anticipates,” “intends,” “plans,” “believes,” “seeks,” “estimates” and similar expressions or variations of such words are intended to identify forward-looking statements. For example, the Company is using forward-looking statements when it discuss the potential of its products, strategic growth plan, its business plan and investment plans, the size of its addressable market, market growth, and expected recurring revenue growth. Forward-looking statements are not historical facts, and are based upon management’s current expectations, beliefs and projections, many of which, by their nature, are inherently uncertain. Such expectations, beliefs and projections are expressed in good faith. However, there can be no assurance that management’s expectations, beliefs and projections will be achieved, and actual results may differ materially from what is expressed in or indicated by the forward-looking statements. Forward-looking statements are subject to risks and uncertainties that could cause actual performance or results to differ materially from those expressed in the forward-looking statements. For a more detailed description of the risks and uncertainties affecting the Company, reference is made to the Company’s reports filed from time to time with the Securities and Exchange Commission (“SEC”), including, but not limited to, the risks detailed in the Company’s annual report for the year ended December 31<sup>st</sup>, 2020, filed with the SEC. Forward-looking statements speak only as of the date the statements are made. The Company assumes no obligation to update forward-looking statements to reflect actual results, subsequent events or circumstances, changes in assumptions or changes in other factors affecting forward-looking information except to the extent required by applicable securities laws. If the Company does update one or more forward-looking statements, no inference should be drawn that the Company will make additional updates with respect thereto or with respect to other forward-looking statements.*

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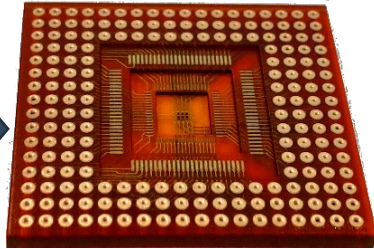


**NANODIMENSION**

Electrifying Additive Manufacturing®

# NANO DIMENSION AT A GLANCE

- Over **\$1.47 billion** cash\* and no debt (as of March 2021)
- **>\$50 million** invested in R&D over 6 years
  - *Planned to be increased by order of magnitude*



In market with over **60** systems deployed.

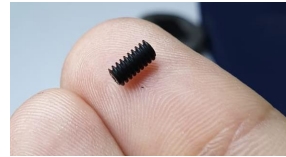
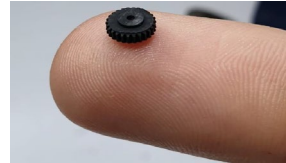
SMARTER

CLEANER

FASTER

Additively Manufactured Electronics

**NaNoS SHOP** 3D Fabrication Service



**Fabrica: 3 systems deployed**  
Micro-Printing  
1 Micron accuracy

\* Including short- and long-term unrestricted bank deposits



**NANODIMENSION**  
Electrifying Additive Manufacturing™

# PRODUCE COMPLEX PCB AND Hi-PEDs™

## Hi-PEDs™

HIGH  
PERFORMANCE  
ELECTRONIC  
DEVICES



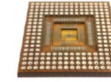
AME Circuit with  
Capacitors



IOT Access  
Point



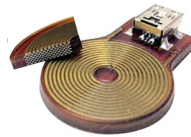
AME with Side  
Mounted  
Components



Vertically Stacked  
Integrated Circuits



Low Pass Filter



Coils & Inductors



3D MID



RF Antenna

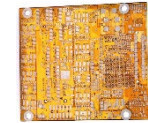
➤ Fast prototyping,  
hours vs weeks

➤ Tens of layers  
in a 3mm board

➤ Printed embedded  
components

➤ Expand 3D scales

COMPLEX  
MULTILAYER  
PCB  
(50 LAYERS)



➤ Filled Vias:  
No need for  
drilling

# A FACTORY IN A BOX

ALL OF THIS ...

...REPLACED WITH THIS!  
>60 machines  
w/paying customers



# TIMES ARE CHANGING...

---



# EVOLUTION OF THE PRINTING INDUSTRY(1)



1907



1950



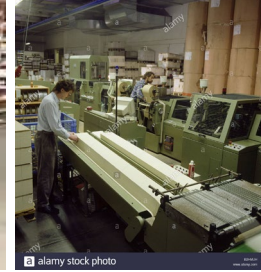
1965



1970



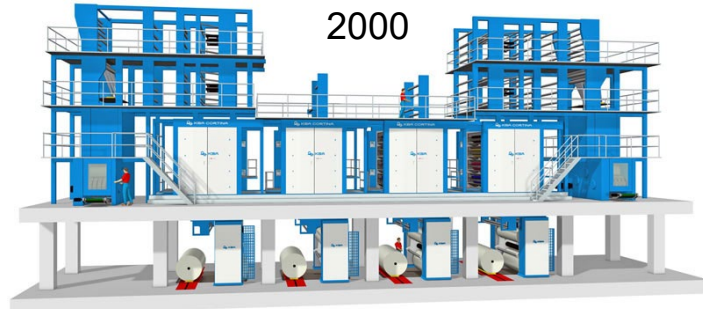
1970.....



.....1990



# EVOLUTION OF THE PRINTING INDUSTRY(2)



2000

*KBA Cortina*, a waterless web press for newspapers and semi-commercials.

**2001** – Market consolidation

- HP acquires Indigo.
- Scitex sells off Vio and Karat, which is bought by KBA.

**2002** – Xeikon bankruptcy

- In March Belgian electronics specialist Punch buys **Xeikon**, which had been declared bankrupt earlier that month. The other bidders were Manroland and Yam International.

**2003** – Decline of offset printing

- Kodak forms a dedicated commercial printing business unit. The division includes its *NexPress* joint venture with Heidelberg.
- The overall volume of sheetfed offset print revenues reaches its lowest point in the decade. 2007 will be the best year.

**2004** – Heidelberg focuses on sheetfed offset

- **Heidelberg sells off its web press division to Goss and its NexPress digital arm to Kodak. It intends to focus uniquely on sheetfed presses.**

**2005** – Konica Minolta and Canon digital presses

- **The market for digital presses keeps expanding** with the launches of the *Konica Minolta Bizhub* and *Canon Imagepress*.
- **EFI acquires VUTEK** and enters the wide-format **inkjet market**. It will later also **acquire Jetrion, Raster Graphics, and Cretaprint**, making it a **dominant leader in this market**.

2001



Among the digital presses the *NexPress* (JV - Heidelberg & Kodak), and the Manroland *DICOWeb* **The DICOWeb is, however, a short-lived commercial failure.**

# EVOLUTION OF THE PRINTING INDUSTRY(3)

2007 - Short run on-demand book printing



2008



2009



2012 - nanographic printing presses

# EVOLUTION OF THE PRINTING INDUSTRY(4)



2014

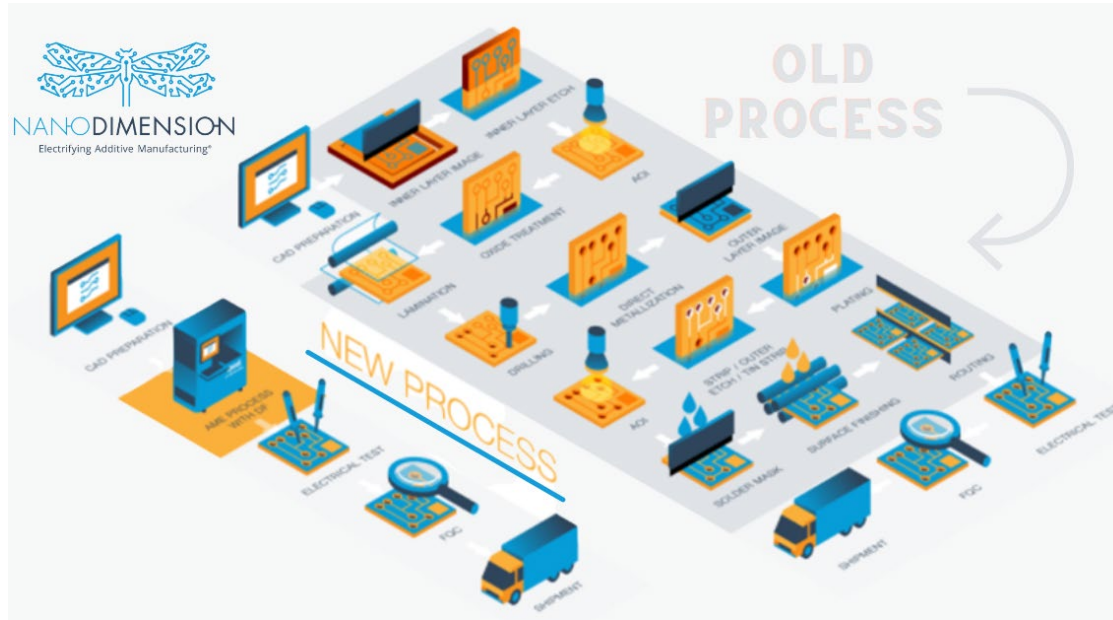


2015 - Digital label printing



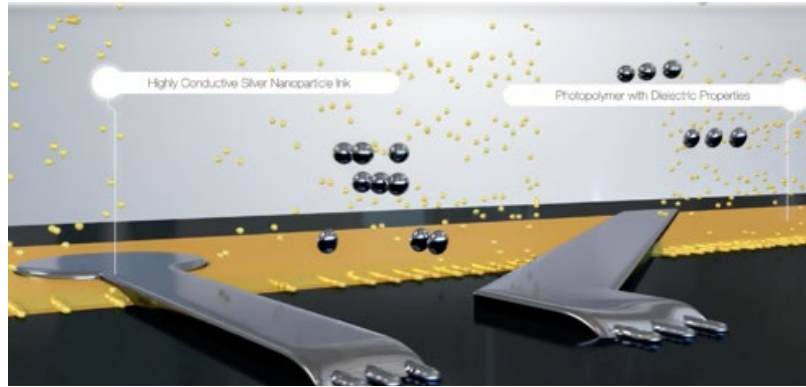
2016 - inkjet

# ADDITIVE MANUFACTURED ELECTRONICS (AME) SIMPLIFIES A COMPLEX PROCESS



- Traditional PCB manufacturing is a complex, multistep process, including layering, photolithography, drilling, plating.
- Over 70 steps are required to make the PCB, and this does not include assembly which is required thereafter.
- AME removes many of the challenges of this intensive process, while also allowing completely new designs.

# HOW IT WORKS



## TWO PRINTHEADS INKJET BOTH MATERIALS SIMULTANEOUSLY:

- Both conductor & insulator substrates are printed
- Both materials are activated in real – time on-the-fly
- 100% fully additive process!

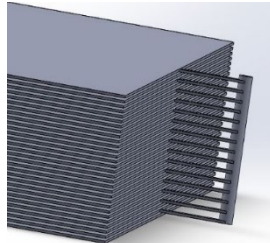
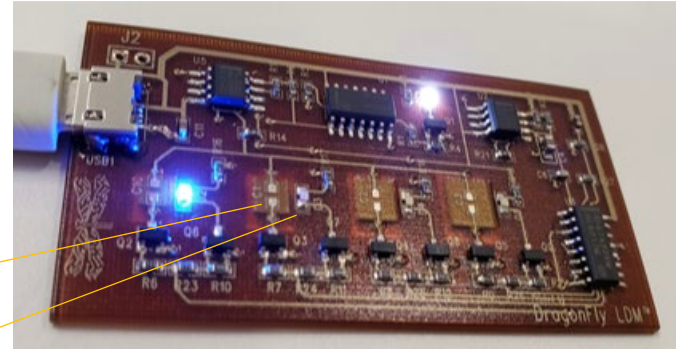


## THE OBJECT IS BUILT UP, LAYER BY LAYER, THROUGH FULL STACK THICKNESS:

- Conductive layers & dielectric layers
- Drills and vias bottom up printed
- Soldermask & annotation

# EXAMPLE OF Hi-PEDs™ : FUNCTIONAL CAPACITORS BY ADDITIVE MANUFACTURING

- Produced simultaneously during the additive manufacturing of PCBs
- Reduce the total size of the PCB
- Freeing surface area for mounting other PCB components



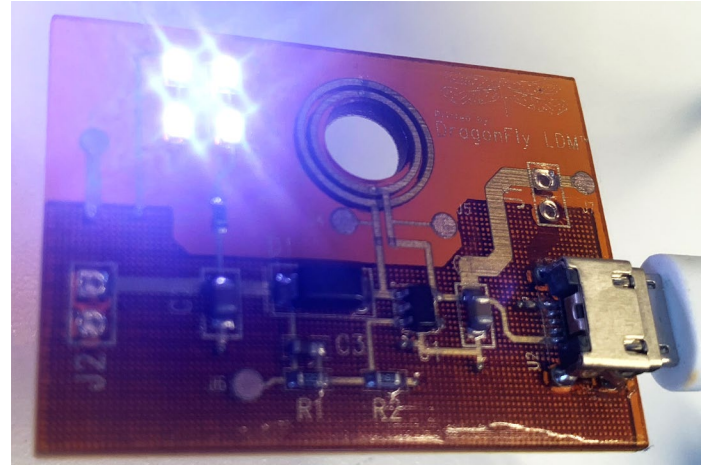
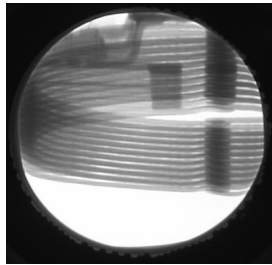
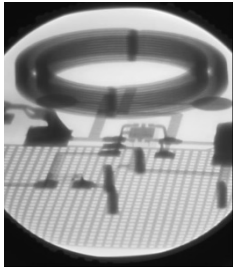
Design



Actual

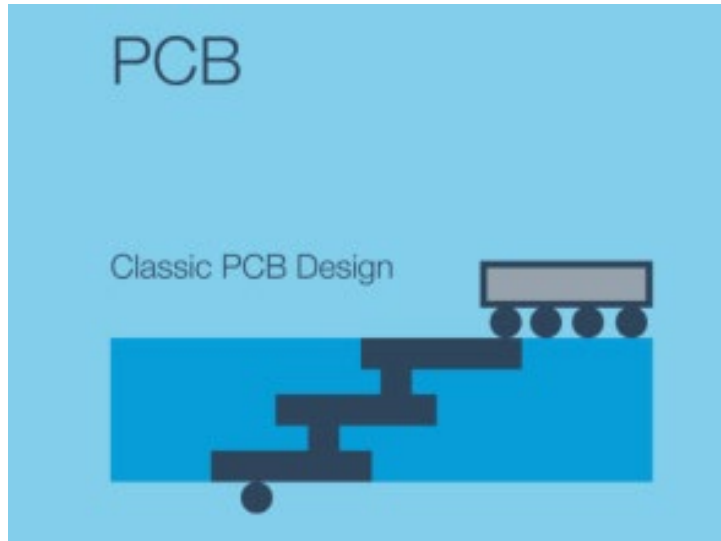
## EXAMPLE OF Hi-PEDs™ : IN PCB PLANAR DC-DC UP CONVERTER TRANSFORMER

- The most common DC-DC Up Converters are units mounted on a PCB
- By producing the device as an integrated part of the PCB, surface area usage, assembly time, and other overhead costs are reduced.

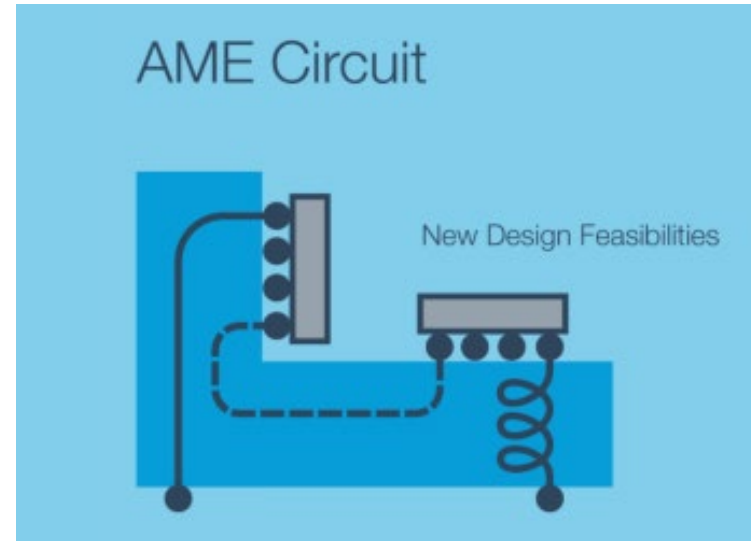


# AME ALLOWS NEW DESIGNS

Traditional design of printed circuit boards



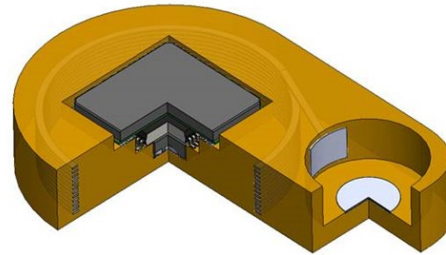
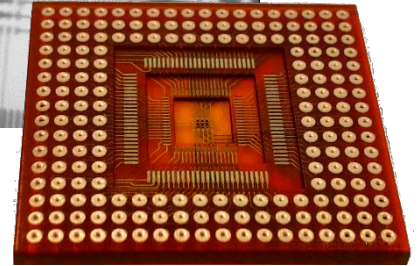
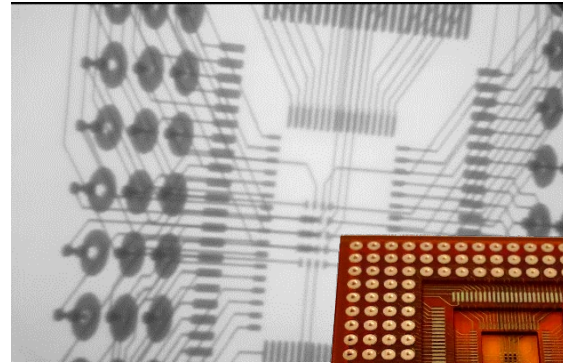
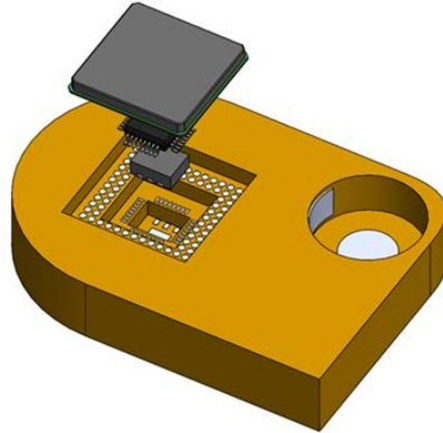
High Performance Electronic Devices™ (Hi-PEDs™) not otherwise possible





# EXAMPLE OF Hi-PEDs™ : VERTICALLY STACKED INTEGRATED CIRCUITS (ICS)

Stacked ICs have a higher circuitry density than traditional PCBs by allowing ICs to be mounted and interconnected on top of each other.



# KEY CAPABILITIES WITH Hi-PEDs™

## Advanced RF Solutions



## Advanced Packaging Solutions



## Advanced Sensor Solutions



# NANO DIMENSION EVOLUTION: LIGHTS-OUT DIGITAL MANUFACTURING (LDM)

## Best in class 3D printer for electronics

- 24/7 printing in a compact system
- Integrated AI Software
- Special Ink Solutions
- Smart management for printer uptime
- Simple and fast operation
- Automatic print head maintenance and cleaning system

**DragonFly® LDM**  
Early Adopters:  
Fast Prototyping & Sample  
Production  
Q3 2019

**DragonFly® LDM 2.0**  
Fast Prototyping & Sample  
Production  
Q2 2021

**DragonFly® LDM 2.0**  
Fast Prototyping & Sample  
Production  
Q2 2021

**DragonFly® Pro**  
Industrial: Early Product  
2018-2019

**DragonFly**  
First Prototype  
2013-17



## FABRICA – SINCE APRIL 2021

- 2<sup>nd</sup> Generation AME  
Code: **"BF"**  
2022/3 and on

Development is on  
the way

- 3<sup>rd</sup> Generation AME  
Code: **"HB"**  
2023/4 and on

Development is on  
the way

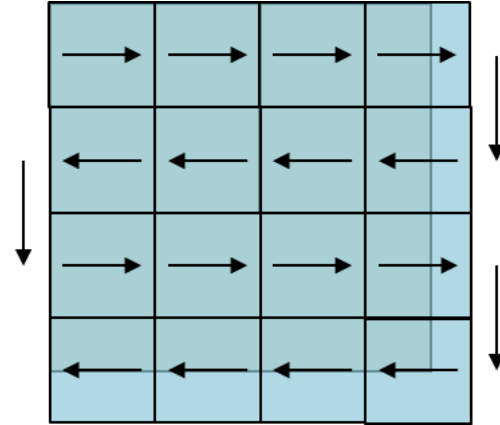
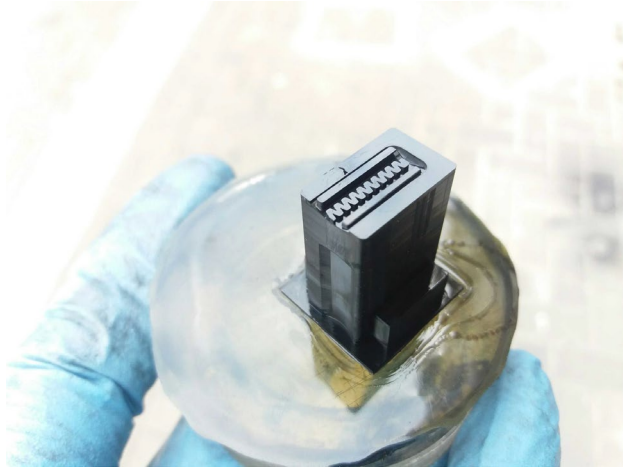
### Fabrica / TERA 250

3 Machines already w/paying customers



# FABRICA – TERA 250 STITCHING

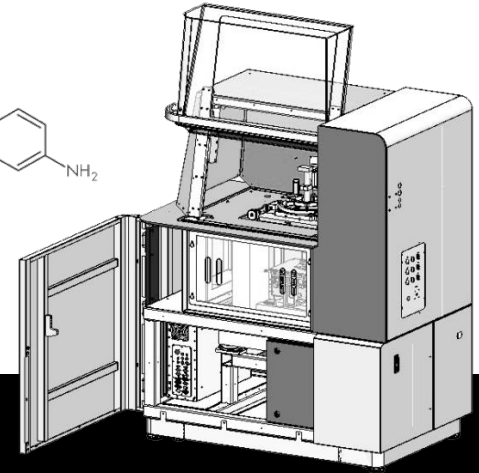
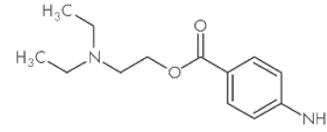
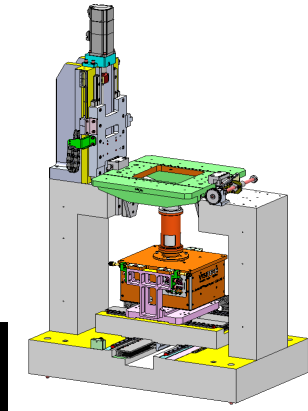
Stitching between tiles enables large build volume printing



# FABRICA – TERA 250 PATENTS

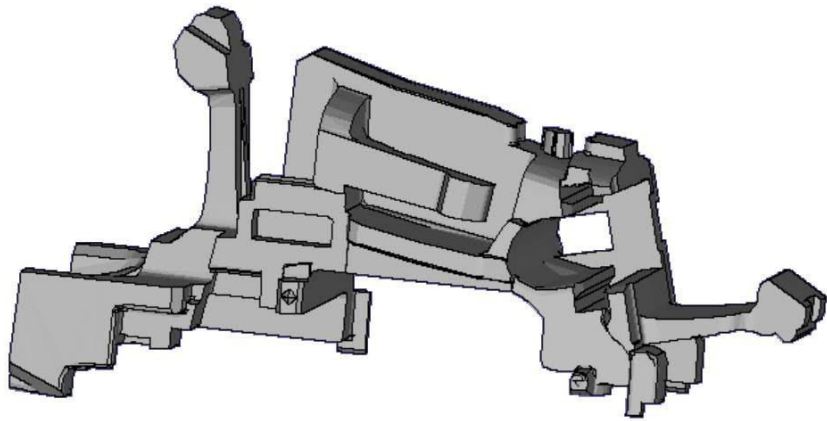
## Additional 6 patents

- ✓ HW & OPTICS
- ✓ MATERIALS
- ✓ SW



# FABRICA – COMPLEX MICRO ELECTRONIC DEVICE

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5 mm



# COMPLEX MICRO ELECTRONIC DEVICES



Government Agency

## ELECTRICAL CONNECTORS

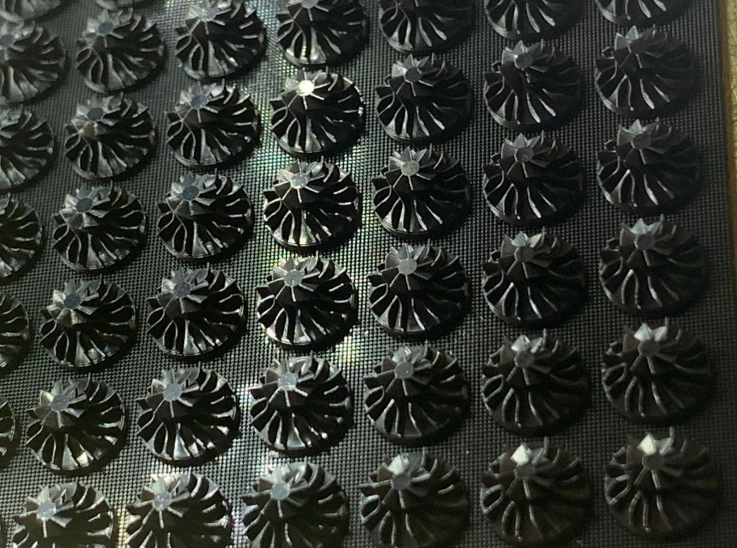




# COMPLEX MICRO MECHANICAL DEVICES



# MICRO MECHANICAL PARTS



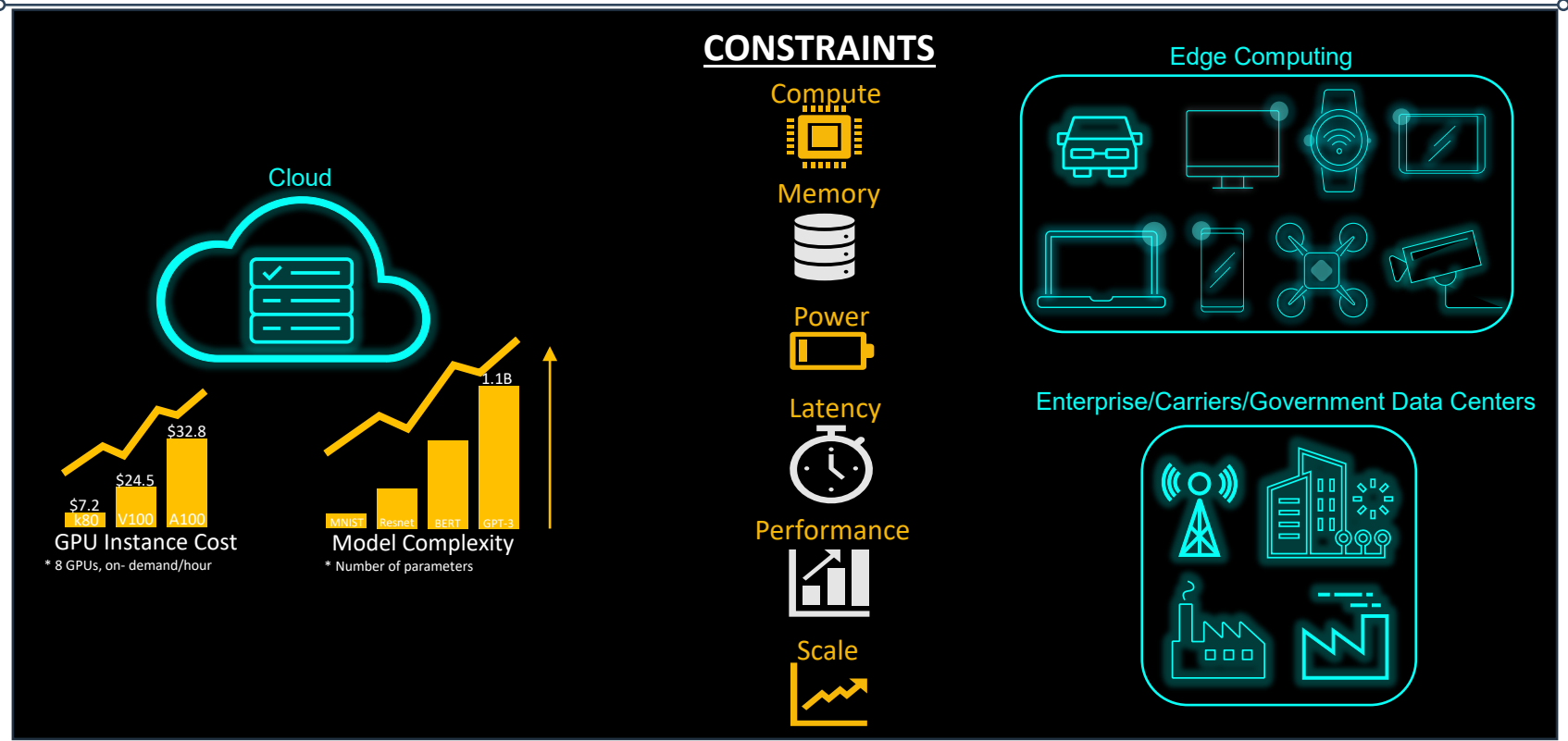
## DEEPCUBE: ACQUISITION SINCE APRIL 2021

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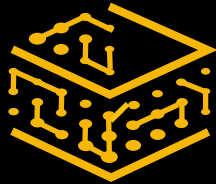


*Hardware agnostic, Deep Learning software acceleration designed based on breakthrough research for both training and inference frameworks*

# DEEP LEARNING (DL) FREE OF TRADITIONAL CONSRNAITS



# DEPLOYING OPTIMIZED MODELS IN THE REAL WORLD



DEEPCUBE

The change needed:

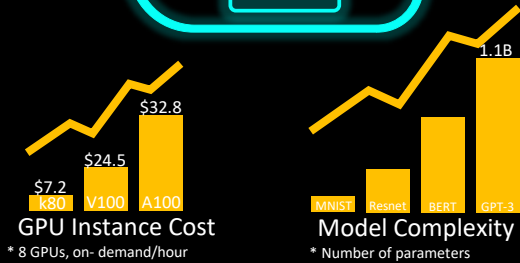
Training production models

**CONNECTED WITH**

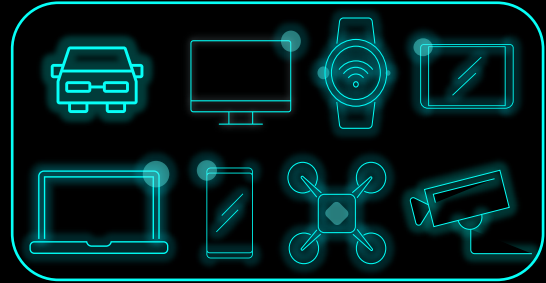
High performance model  
execution in the real physical  
world



Cloud



Edge Computing

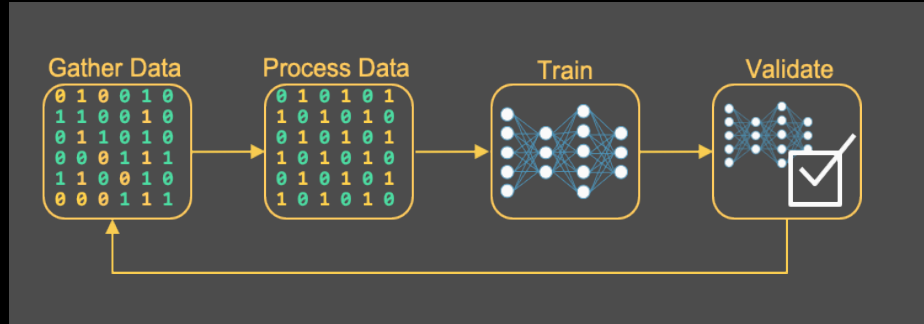


Enterprise/Carriers/Government Data Centers



NANODIMENSION  
Electrifying Additive Manufacturing™

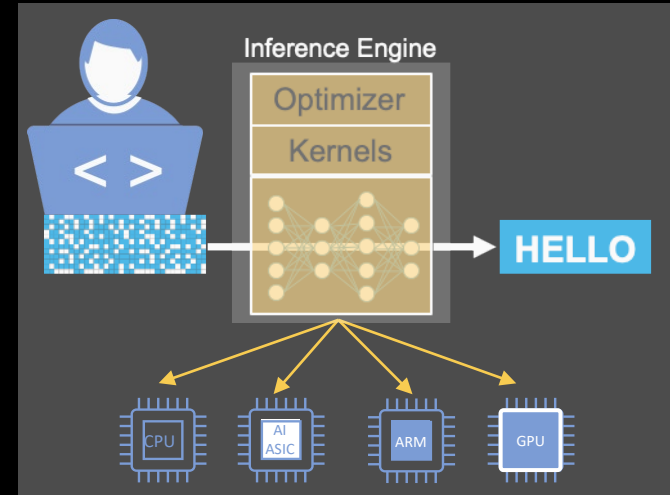
# DL MODELS ARE USUALLY INEFFICIENT & JITTERY



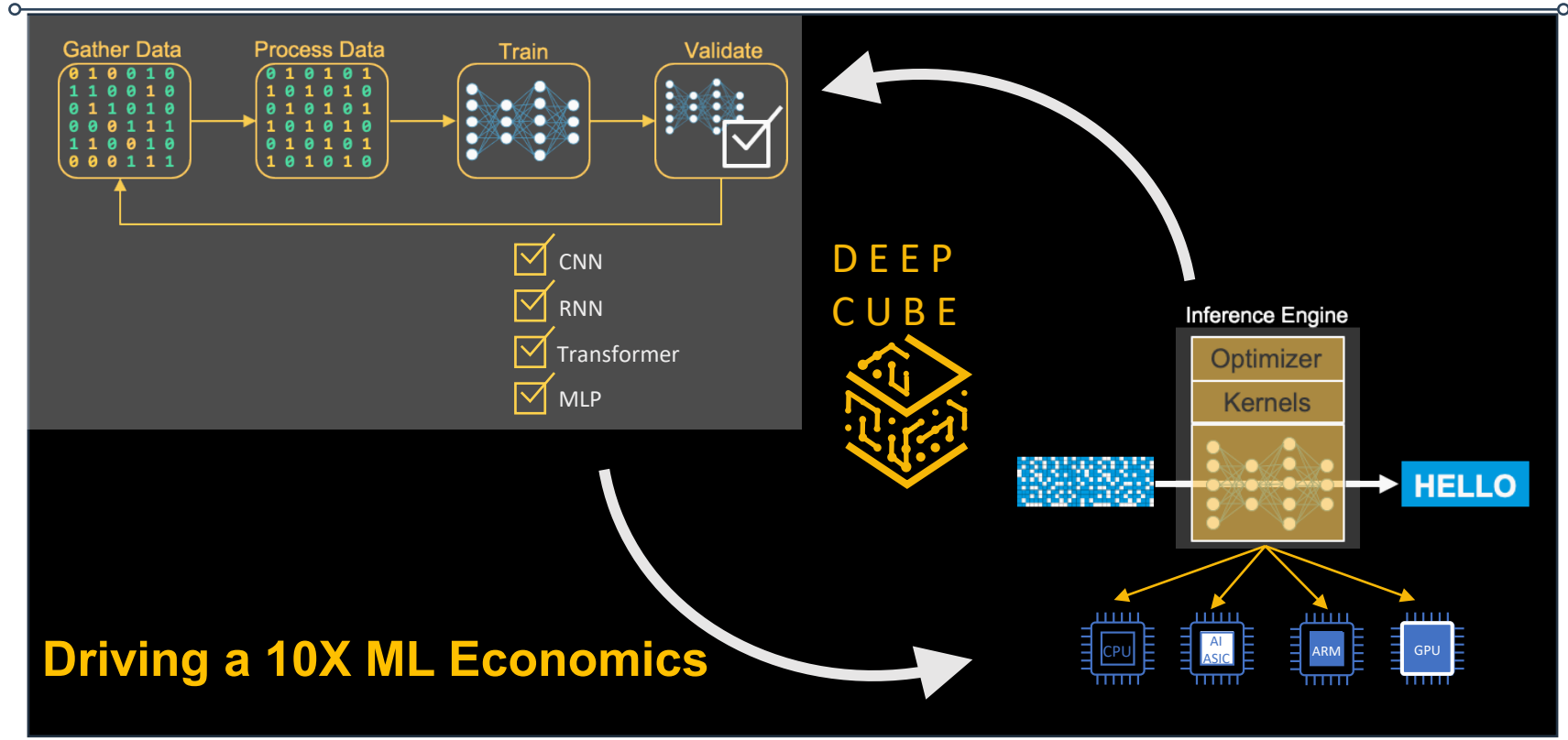
Models are developed in a synthetic environment, unrelated to real world constraints



Constraints such as latency, performance, power, memory are impeding mass ML deployment



# FUSING TOGETHER TRAINING AND INFERENCE



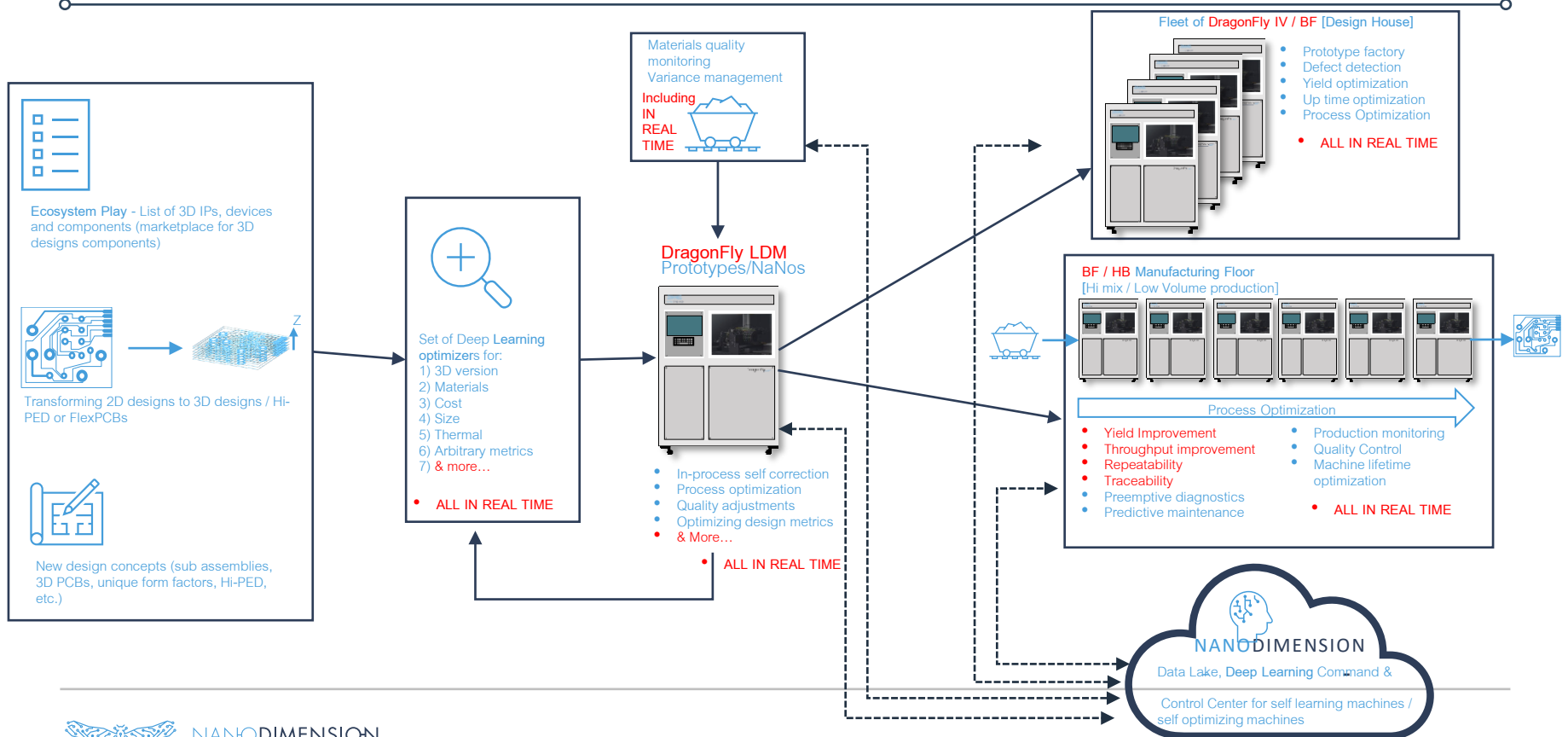
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*“People who are really serious about **software**  
should make their own **hardware**”  
- Alan Kay*

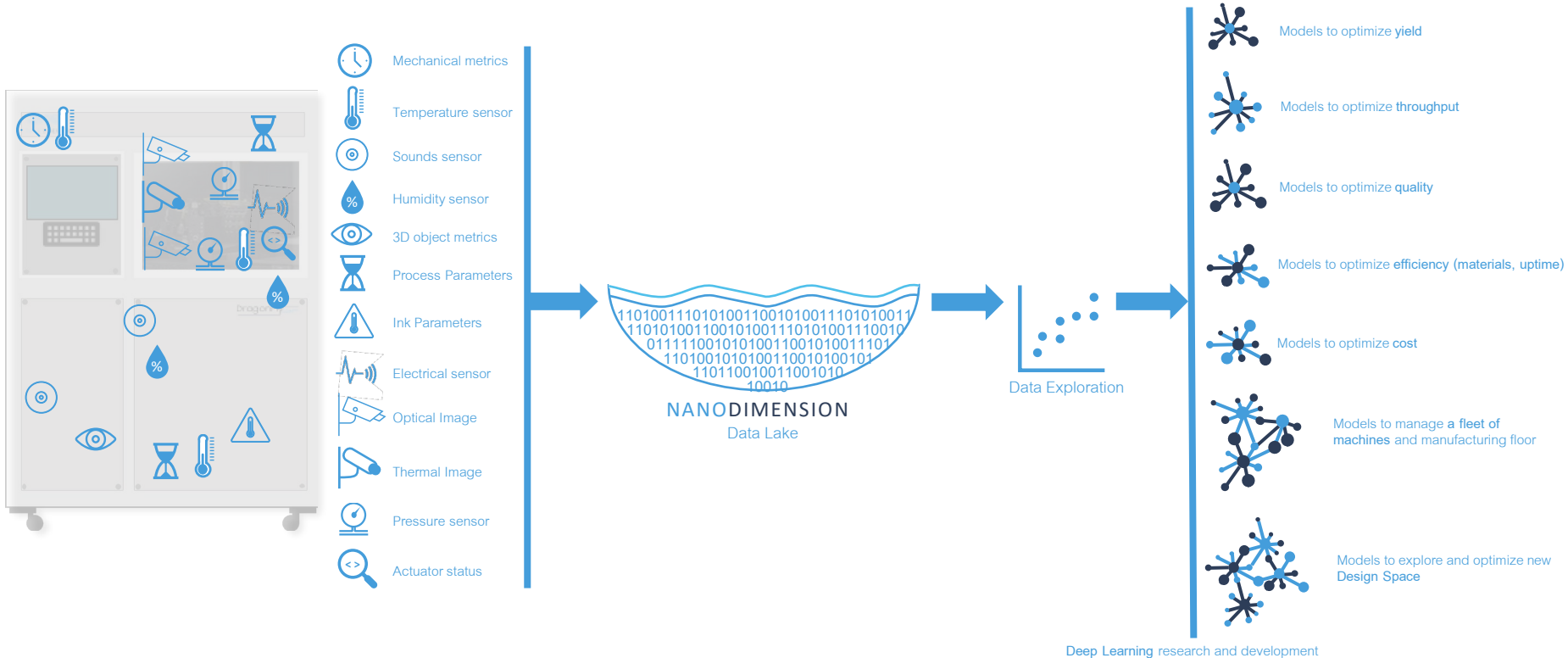
*“People who are really serious about  
**manufacturing**  
should develop their own **Deep Learning**”*



# OPTIMIZE CAPEX, REVENUE, DESIGN SPACES, AND USE CASES

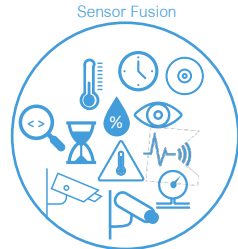


# CONTINUOUS COLLECTION GLOBALLY AND CREATION AND REFINEMENT OF MULTI-PURPOSE LEARNING MODELS



# CLOUD BASED DL FRAMEWORK FOR SELF LEARNING MACHINES

Design and Prototype customers and eco system players



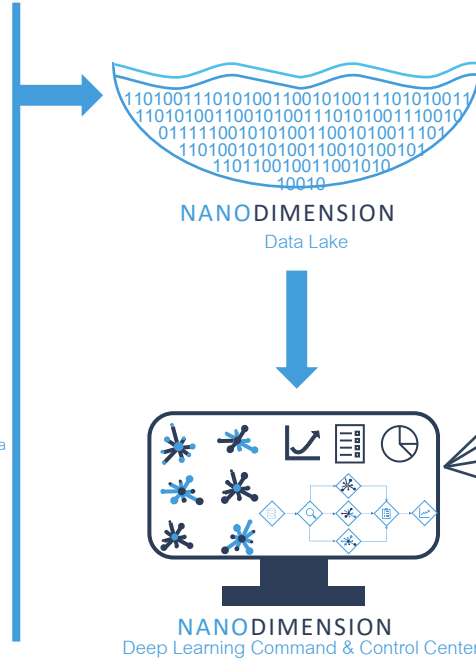
High mix / low volume production customers



Actions, labels, tracking, lifetime data



Data bases, ERP, suppliers



CUSTOMER A: OPTIMIZE OPEX



CUSTOMER B: OPTIMIZE QUALITY



CUSTOMER C: OPTIMIZE YIELD/THROUGHPUT




CUSTOMER D: OPTIMIZE TIME TO PROTOTYPE



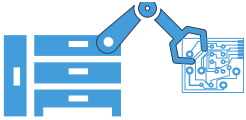
CUSTOMER E-Z: BROAD DEEP LEARNING  
FRAMEWORKS TAILORED TO DIFFERENT BUSINESS  
METRICS

# INDUSTRY 4.0 – GROWTH OPPORTUNITY FOR INDUSTRY WIDE DEEP LEARNING FOR MANUFACTURING

**NANODIMENSION**



Customers, Suppliers & Partners assets

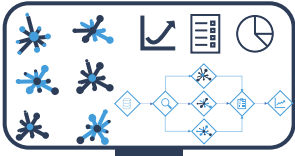


Any PCB and FlexPCB (SALES)

Customers, Suppliers & Partners assets



3D Printers

**NANODIMENSION**  
Deep Learning Command & Control Center

Hi-PEDs = High Performance Electronic Devices

Nano Dimension Customers:  
Premium Hi-PEDs PCB factories or OEM producers




Med-PEDs = Medium Performance Electronic Devices


Nano Dimension Customers:  
Mid-PEDs PCB factories or OEM producers



**NANODIMENSION**  
Deep Learning SaaS



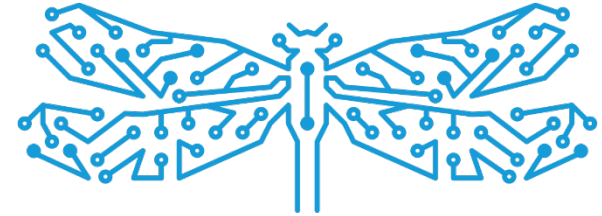
3<sup>rd</sup> party 3D printing machines  
Metal, Polymers, others



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**NANODIMENSION**

Electrifying Additive Manufacturing®

## Electronics Sector:

Electronics, PCB, PCBA, IH, ATE,  
Electro Mechanics, Micro-Mechanics, MEMS, etc.



## Vision

To transform the **electronics sector** into an environmentally friendly & economically efficient additive manufacturing Industry 4.0 – enabling a **one-production-step-conversion** of digital designs into functioning electronic devices, on demand, Anytime, Anywhere

## Mission

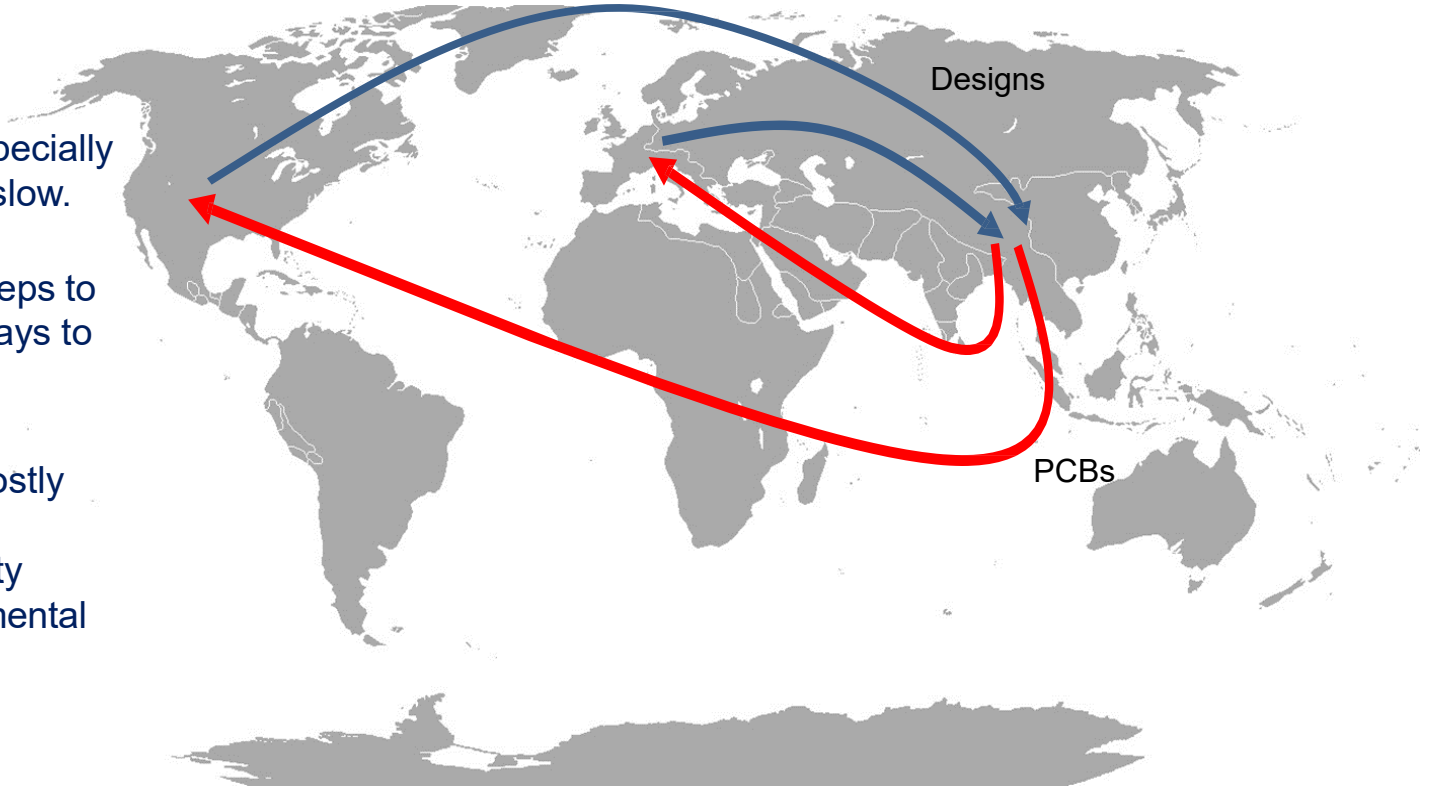
To build an **ecofriendly and intelligent distributed network of additively manufacturing self-learning & self-improving machines**, which will deliver a superior ROI to their owners as well as to Nano Dimension shareholders and other stakeholders.

# THE PROBLEM

Traditional manufacturing, especially for prototyping, is slow.

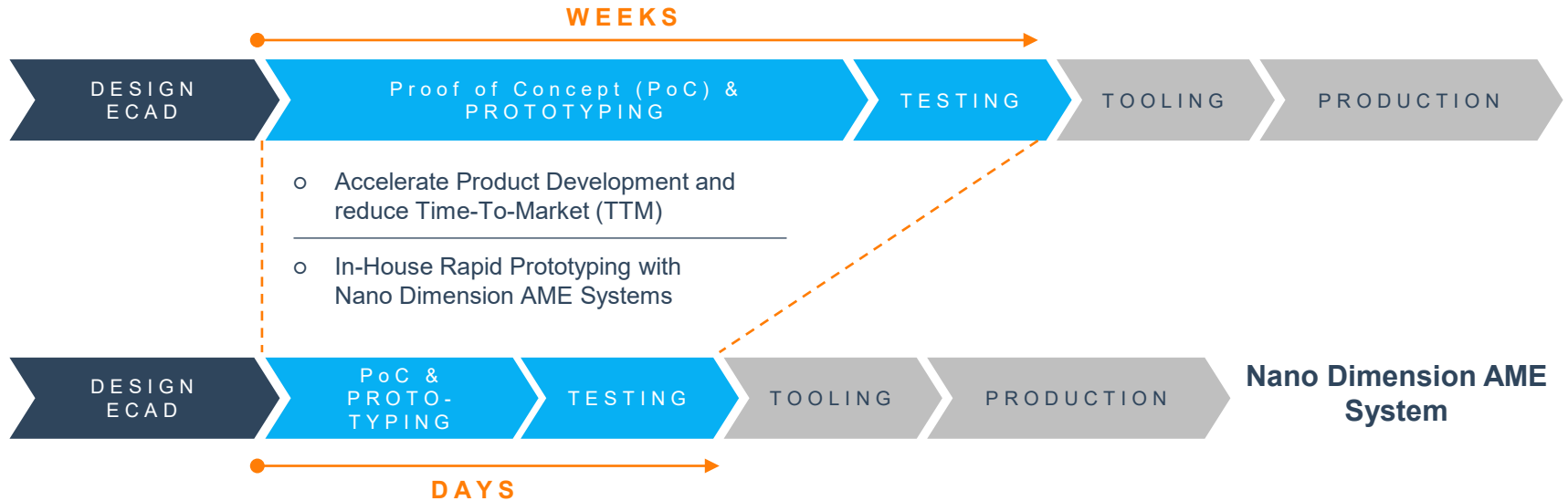
There are many steps to the process with days to weeks in-between.

This is slow and costly with a range of Intellectual Property Risk and Environmental Hazards.



# RETURN ON INVESTMENT – PROTOTYPING

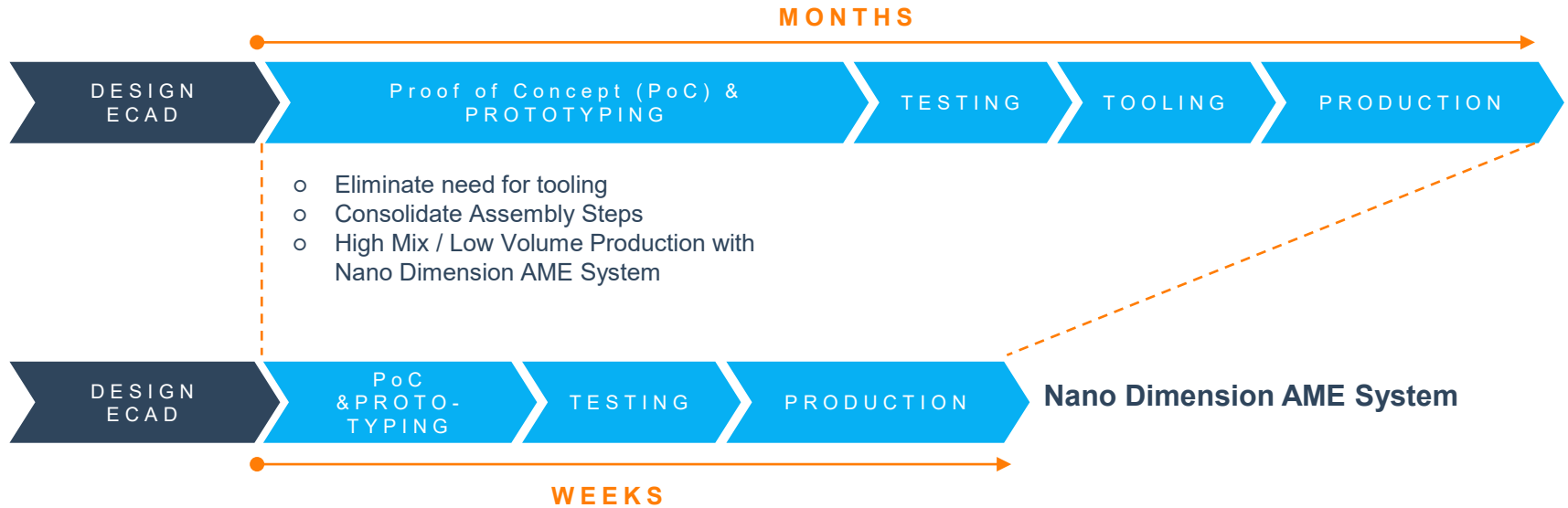
AME changes what is possible for prototyping.



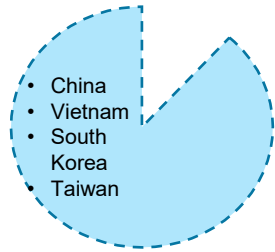


# RETURN ON INVESTMENT – PRODUCTION

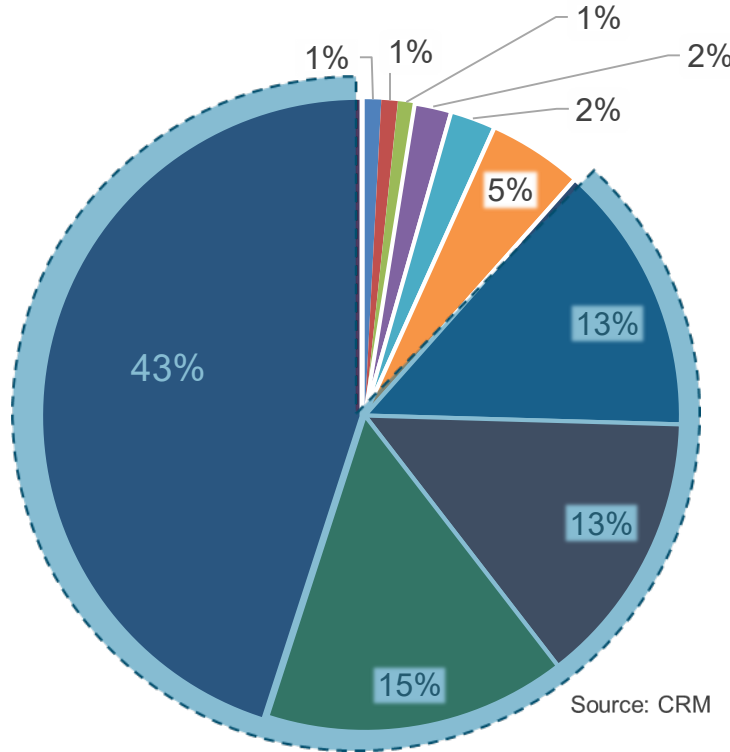
AME changes what is possible for **prototyping**.



# TRADITIONAL PCB MANUFACTURING FOOTPRINT



- Singapore
- Philippines
- Vietnam
- Germany
- Thailand
- USA
- Taiwan
- South Korea
- Japan
- China



Source: CRM

Around 90% of all PCBs are manufactured in the APAC region. China is the largest producer with around 43% market share followed by Japan and South Korea with 15% and 13%, respectively.

Intellectual Property (IP) is cited as a major cause for concern. Hardware design companies regard their PCB designs as core IP and some are reluctant to send them to Asia for prototyping.

# AME / 3D PRINTED ELECTRONICS MARKET

## IDTechEX (2019)

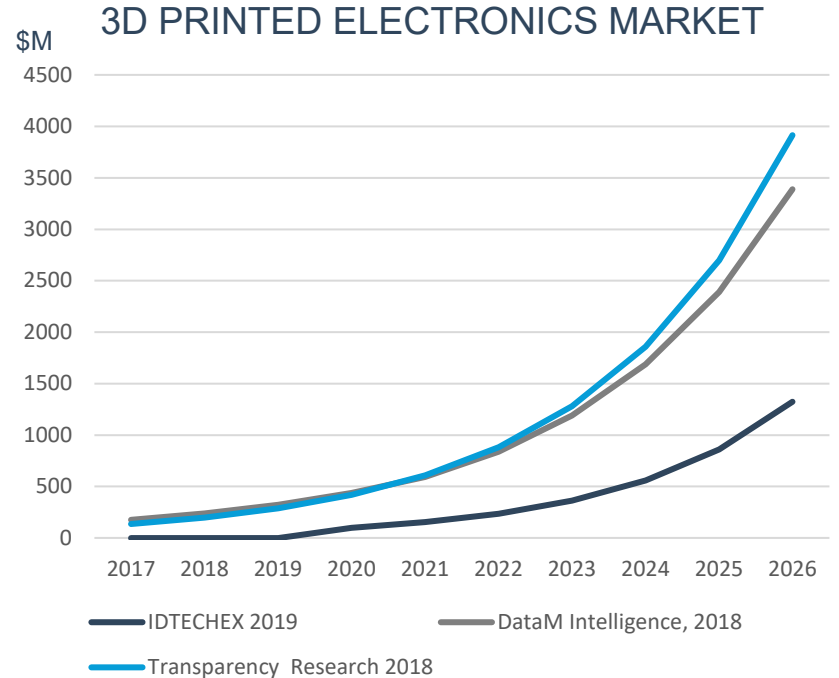
- The total market for 3D printed electronics will be worth \$2.3 billion by 2029 and will be dominated by the professional PCB prototyping market segment. The educational and industrial production market segments will continue to grow steadily.
- The market for professional PCB prototyping is currently growing very rapidly, almost entirely due to market leader Nano Dimension, and already has significant penetration in the consumer and education segments. This growth will slow but this market segment will become the largest by 2021.

## DataM Intelligence (2018)

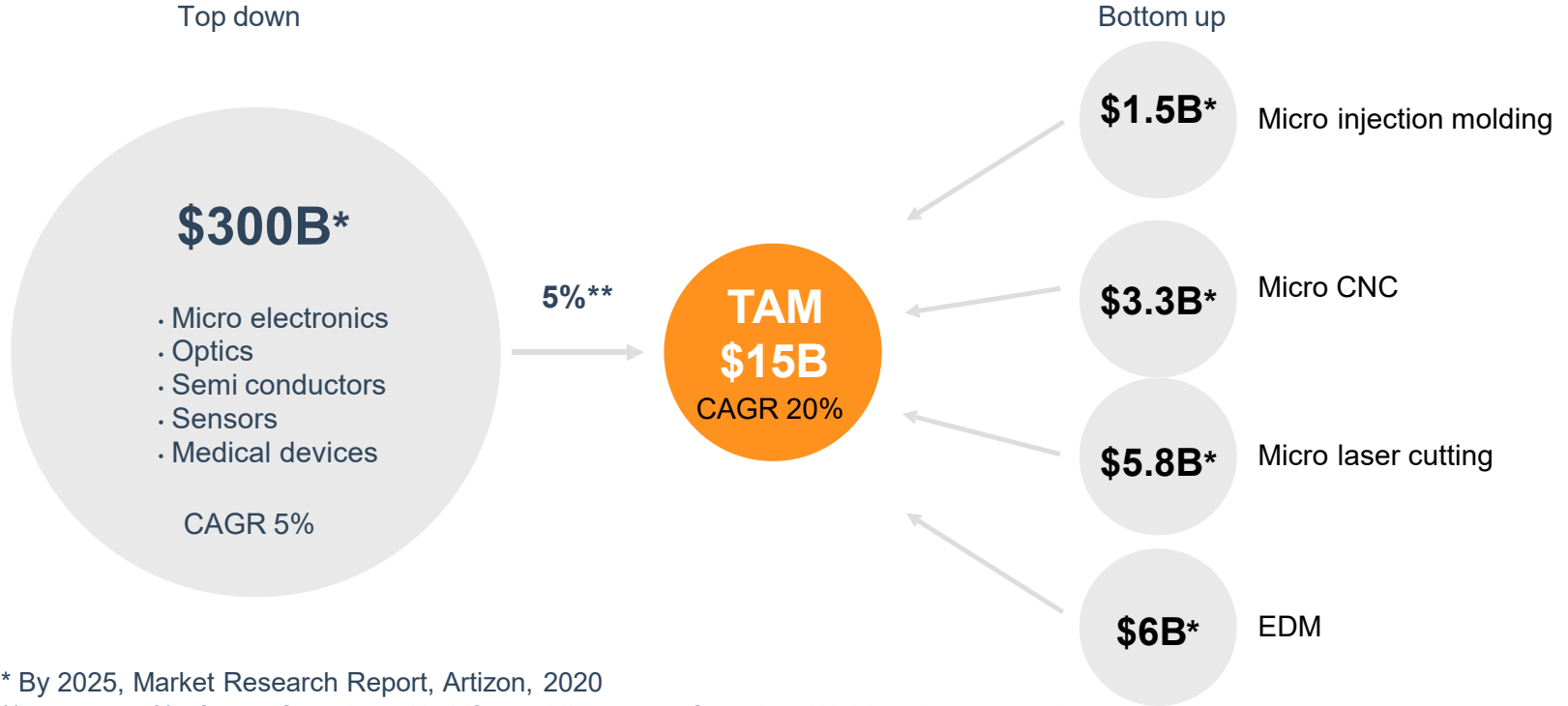
- Analysts predict 3D printed electronics will be the next high-growth application for product innovation: 2017 3D printed electronics market size is estimated at \$176 million, expected to reach \$592 million in 2021 and up to \$2.4 billion by 2025.

## Transparency Market Research (2018)

- The global 3D printed electronics market was valued at US\$ 137.1 million in 2017 and is expected to expand at a CAGR of 44.46% from 2018 to 2026, reaching US\$ 3,915.0 million by the end of the forecast period.



# AM / 3D MICRO PRINTING MARKET



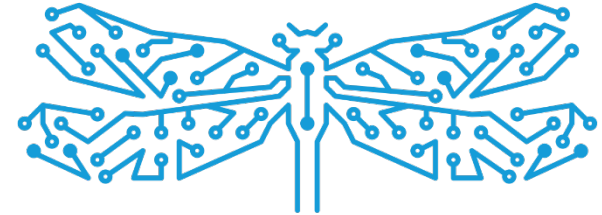
\* By 2025, Market Research Report, Artizon, 2020

\*\* By 2023 5% of manufacturing will shift to additive manufacturing, Wohlers Report, 2018

# TABLE OF CONTENT

---

- Nano Dimension at a Glance
- The Opportunity
- The Technology and Product Offering
- **Financial Highlights**
- Appendix



NANODIMENSION

Electrifying Additive Manufacturing®

# NANO DIMENSION: FINANCIAL DATA

NASDAQ  
**NNDM**  
ADS ratio: 1:1

Shares Outstanding:  
~**249 million** \*

**More than \$50M** invested in R&D, over 6 years

*March 31st, 2021:*

**Cash: \$1.47 billion** \*\*

**No debt**

## Since 01-01-2018:

# of 3D Printing machines sold:

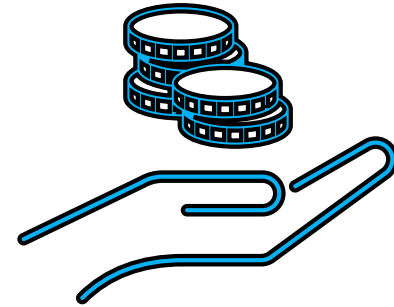
- DragonFly Pro: 49
- DragonFly LDM machines (*since Q3/2019*) 15
- DragonFly Pro upgrades to LDM (*since Q3/2019*) 36
- DragonFly service contracts 43

Total Revenues (*from 01-01-2018 to 03-31-2021*): \$16.4M

\* As of March 31st, 2021

\*\* Including short- and long-term unrestricted bank deposits

- Significant trend of **Gross Margin improvements**
- Revenue 2018 - 2019 - 2020:  
\$5.1M - \$7.1M - \$3.4M

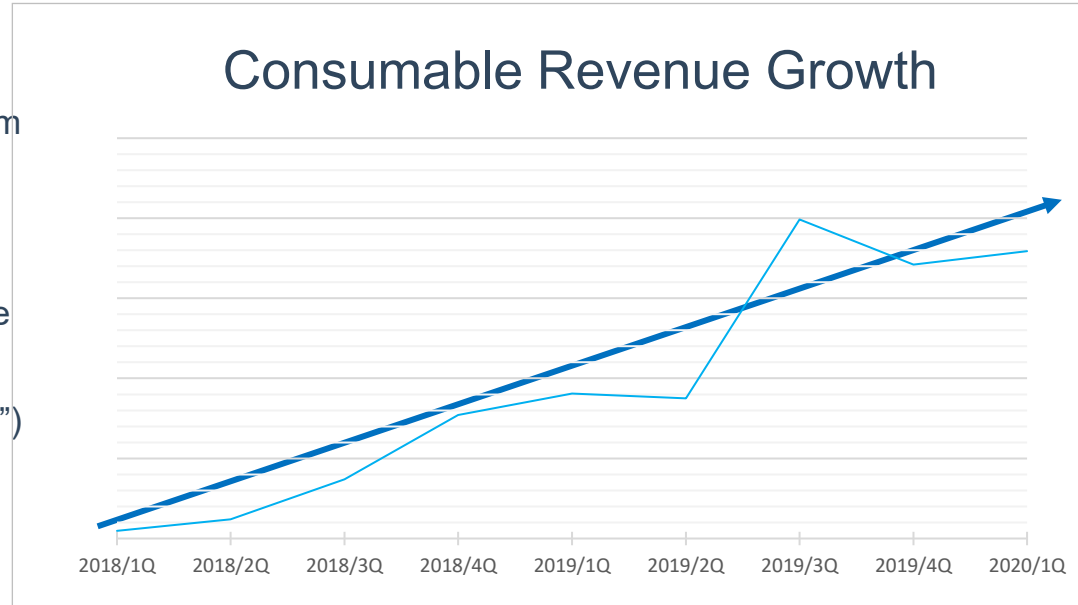


# BUSINESS MODEL: RECURRING REVENUE MODEL THAT SCALES

## “Razor-Razorblade” Model:

- As the installed base of systems grows, the recurring revenues from consumables increases.
- Positive trend of increased ink consumption by customers is a validation to our recurring-revenue business model.
- Printed Electronics (“PE” or “AME”) and Consumable Materials:

**Result: Recurring & High GM Revenue**



# Business model

## Razor Razor Blade

Hardware



Purchase price

**\$350K**

Materials



Recurring revenue

**~\$100K** / machine / year

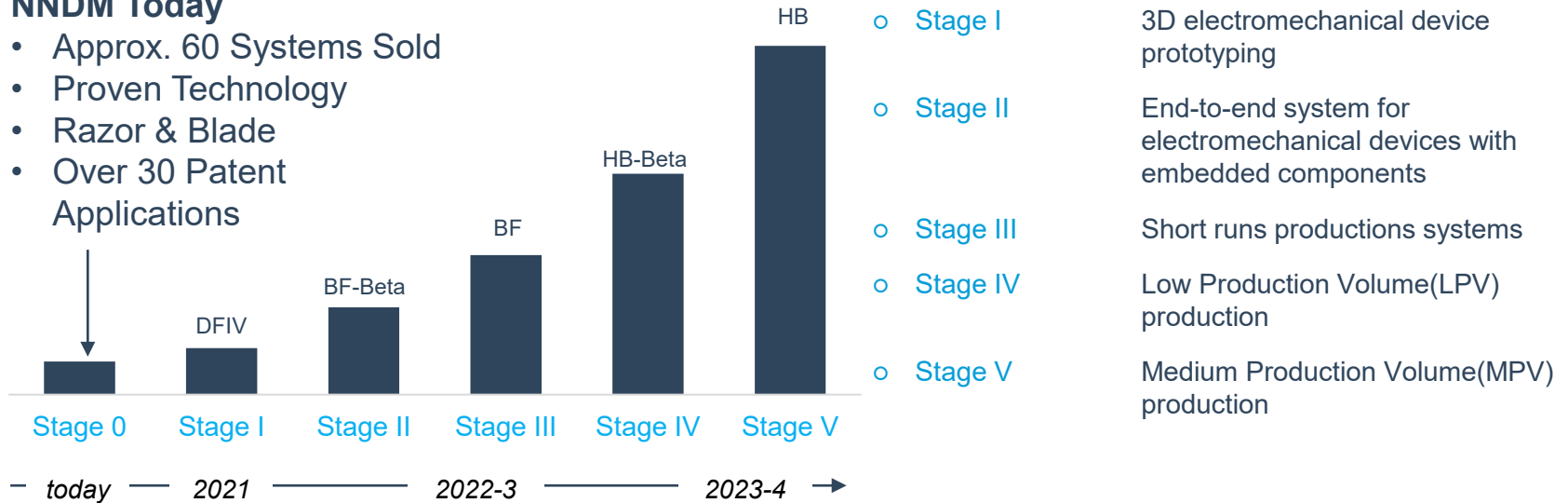


# FAIL SAFE “BIOTECH-LIKE” INVESTMENT MODEL

Since Covid-19’s eruption – **it is not about quarterly Revenue curve**. We are focused on upside through accelerating **Product Technological Edges (Upside like Biotech)**. BUT we have sold approx. 60 machines already. **Contrary to Biotech downsides**, a failure at any **Stage is protected** (as a sale of the existing business at improving multiples, as per stage, is a viable alternative)

## NNDM Today

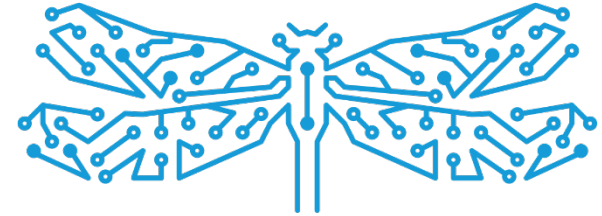
- Approx. 60 Systems Sold
- Proven Technology
- Razor & Blade
- Over 30 Patent Applications



# TABLE OF CONTENT

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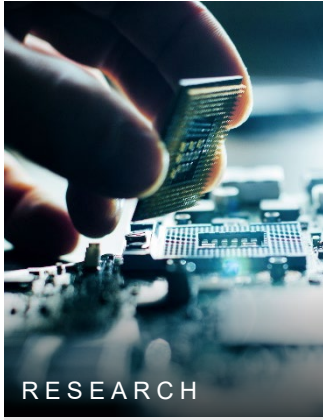
- Nano Dimension at a Glance
- The Opportunity
- **The Technology and Product Offering**
- Financial Highlights
- Appendix



NANODIMENSION

Electrifying Additive Manufacturing®

# OUR CUSTOMERS ARE INNOVATORS IN LEADING MARKETS



## RESEARCH

The DragonFly LDM System enables you to produce cutting edge electronics in your lab.



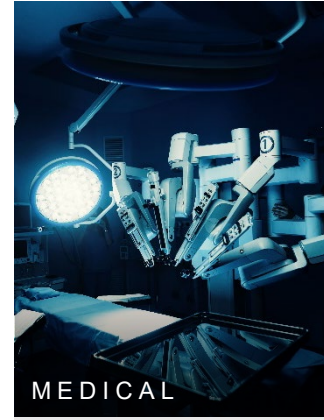
## AEROSPACE

AME Technology enables you to reduce weight and to miniaturize electro-mechanical components like never before.



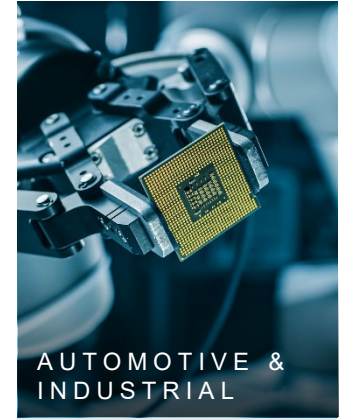
## DEFENSE

Keep your IP in your lab with the DragonFly LDM System and save time by eliminating the need for involving external parties.



## MEDICAL

Reduce time to market and optimize design for medical devices, biomedical sensors and in-vivo applications.



## AUTOMOTIVE & INDUSTRIAL

AME optimizes electromechanical parts for: smart products, IoT, sensors, autonomous driving, electric vehicles, 5G networks.

# REVENUE DRIVERS

---

## Emerging Technologies

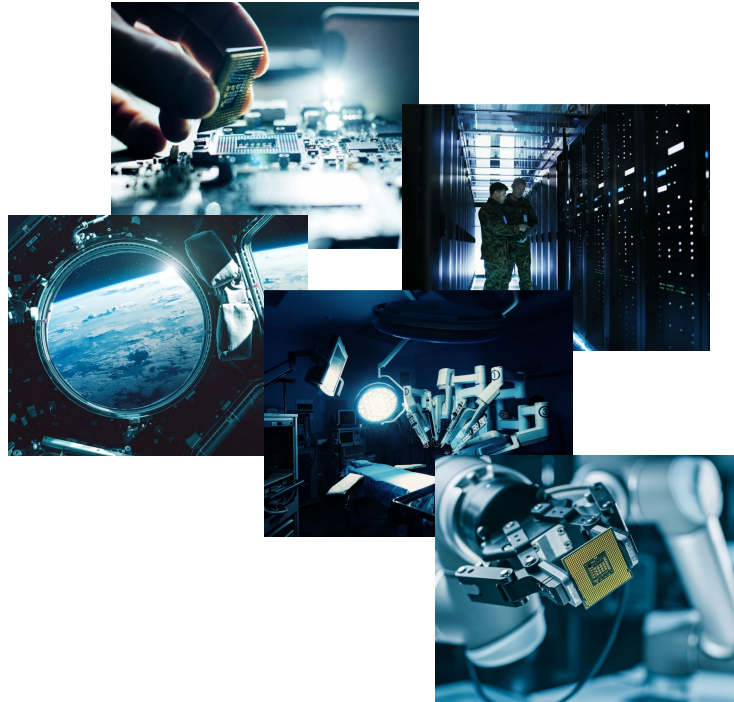
- Communication 5G/RF
- Heterogeneous Integrations
- Aerospace (i.e., micro-satellites)
- Defense
- Medical (i.e., in-vivo devices)
- Automotive Revolution (electrical, autonomous)

## AME drives:

- Fast time-to-market
- IP safety → in-house rapid prototyping and production
- Interactive development
- Device performance gains
- Control of fabrication facilities

Hi-PEDs™ are produced at high quantities that are constructed from **high mix of designs and low volume per variety**. → This necessitates prototyping and low cost of production for low volumes.

- I. Research Institutes: [CBN-IIT](#)
- II. Aerospace: [HARRIS](#)
- III. Defense: [HENSOLDT](#)
- IV. Medical: [PIEZOSKIN](#)
- V. Automotive: [REHAU](#)



# GLOBAL CUSTOMERS

## Nano Dimension Customers:

- 3 Multi-billion US\$ defense manufacturers
- 2 European defense companies and multiple Secret Service Agencies
- 1 Multi-billion US\$ valued technology conglomerate
- Multiple leading research institutions around the world



# INVESTMENT HIGHLIGHTS

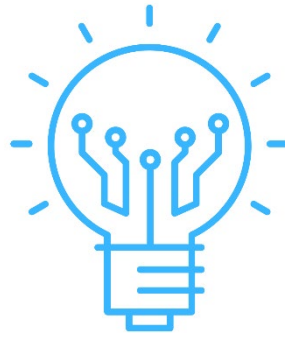
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- ✔ **Growth company** with significant technology and first mover advantage.
  - ~60 3D Printing Machines in market with leading defense & research organizations.
  - Shortening prototyping time while creating multi-layer **Hi-PEDs™** in house.
  - R&D of unique, miniaturized, lower weight solutions fabricated in high mix/low volume almost only by 3D-printing.
- ✔ **INVESTMENT THESIS:** Biotech investment model – with hedged downsides
  - Since Covid-19 eruption – it is not about quarterly revenue curve.
  - Focused on accelerating product technological edge for biotech like upside, but reduced downside due to improving multiples of existing business.
- ✔ **Acquisitions** of **DeepCube** and **Nanofabrica** to drive self-learning machines and integration of electronics with micro parts.
- ✔ **NaNoS™** is a new offering enabling Prototyping Services Business Model (fabrication labs on three continents).
- ✔ **Expected** to reach **inflection point upon conversion from prototyping to production runs.**
- ✔ **Strong cash-position** to engage in strategic activities at minimal risk.

# FABRICATION SERVICES: NaNoS® SHOP

---

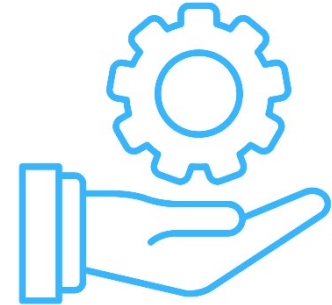
- Nano Services (NaNoS®) is an offering for customers who need to get their hands-on complex, multilayered high-performance electronics with a quick turnaround time.
- Provide 3 different services to customers around the globe with its fabrication labs in the US, Israel and Hong Kong.
- Guaranteed quick turnaround for complex Hi-PEDs™.



**Generate an  
idea**



**Develop a  
project**



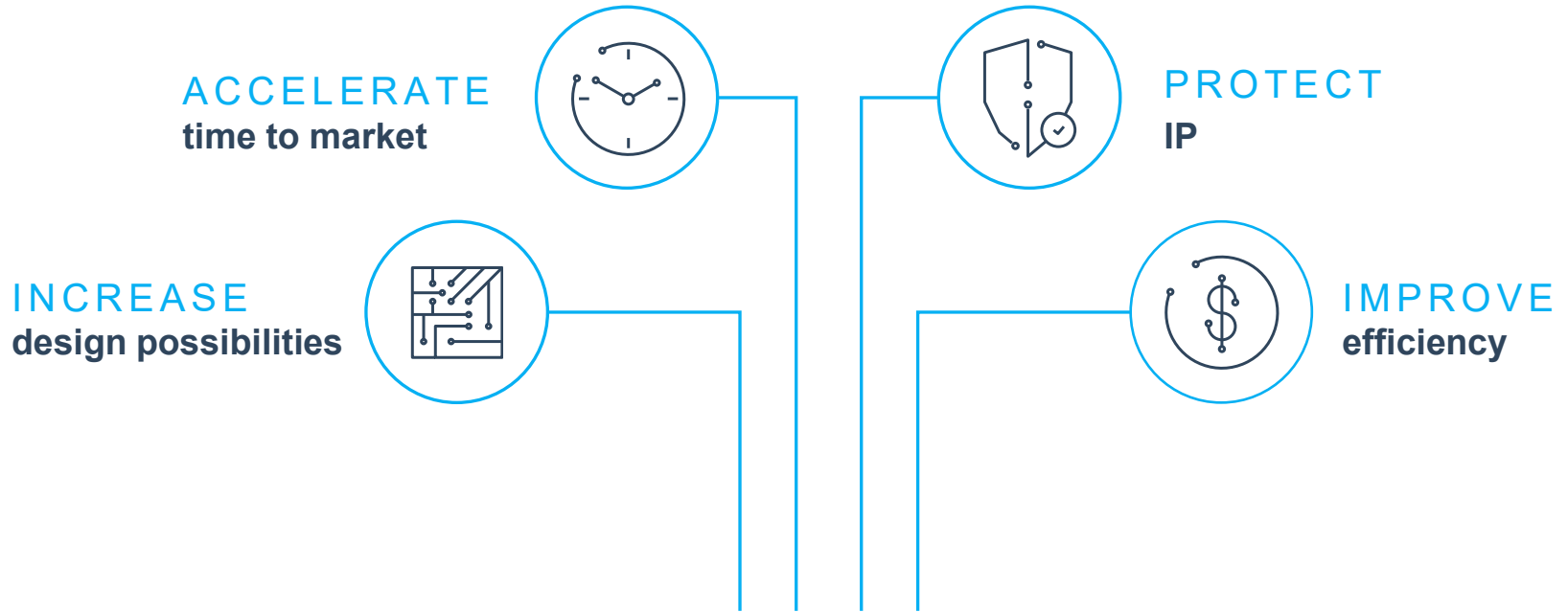
**3D print your  
project**



# WHY ADDITIVE MANUFACTURING FOR ELECTRONICS?

---

AME provides important value drivers that are critical for technological progress.



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- The Opportunity
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- Financial Highlights
- **Customer Cases**



NANODIMENSION

Electrifying Additive Manufacturing®

# THANK YOU



NASDAQ: NNDM

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[www.nano-di.com](http://www.nano-di.com)

# APPENDIX 1



NASDAQ: NNDM

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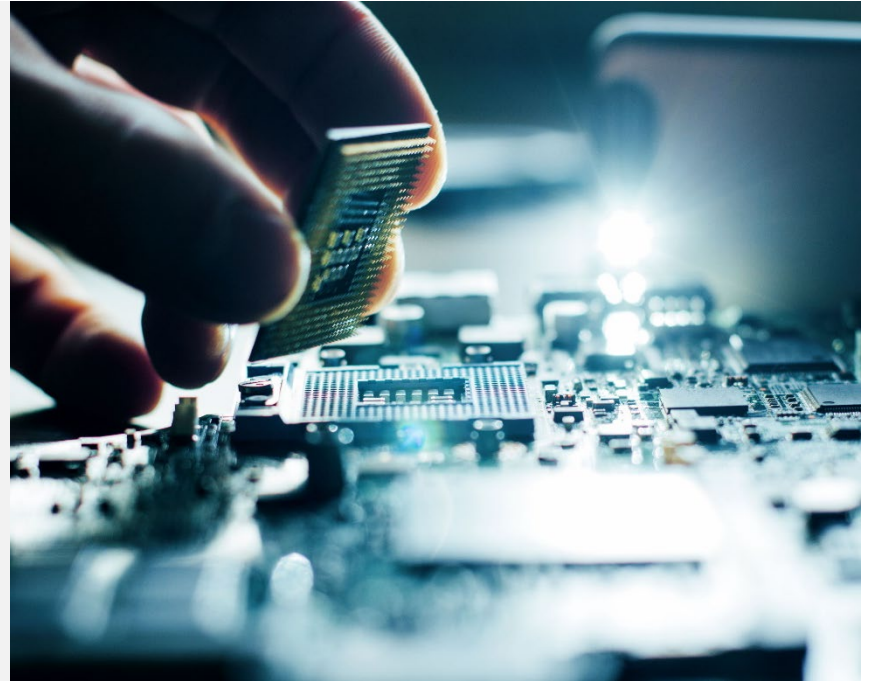


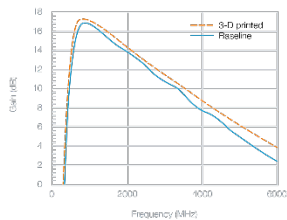
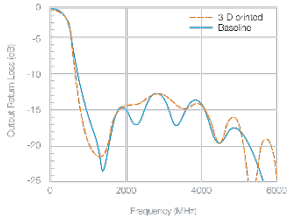
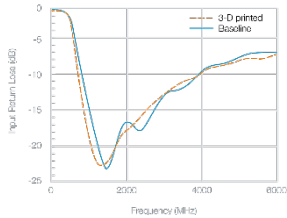
www.nano-di.com

“

*The suitability of the DragonFly system to rapidly and affordably manufacture functional prototypes, combined with the broad ecosystem of applications for health and energy harvesting, makes it an ideal choice for our team to achieve higher performance, quick development and print complex shapes not achievable using traditional manufacturing processes.* ”

**Prof. Massimo De Vittorio**  
CBN-IIT — Lecce — Italy





“ The ability to manufacture RF systems in-house offers an exciting new means for rapid and affordable prototyping and volume manufacturing. The results of the study provide substantial motivation to develop this technology further.

”

**Dr. Arthur Paoella,  
Senior Scientist, Space  
and Intelligence Systems,  
Harris Corporation**





### **HENSOLDT and Nano Dimension Achieve Breakthrough in Electronics 3D Printing**

HENSOLDT succeeded in assembling the world's first 3D printed 10-layer printed circuit board (PCB) which carries high-performance electronic structures soldered to both outer sides. This allows rapid prototyping inhouse of complex PCB.

*Military sensor solutions require performance and reliability levels far above those of commercial components. To have high-density components quickly available with reduced effort by means of 3D printing gives us a competitive edge in the development process of such high-end electronic systems.*



**Thomas Müller,**  
**CEO of HENSOLDT**

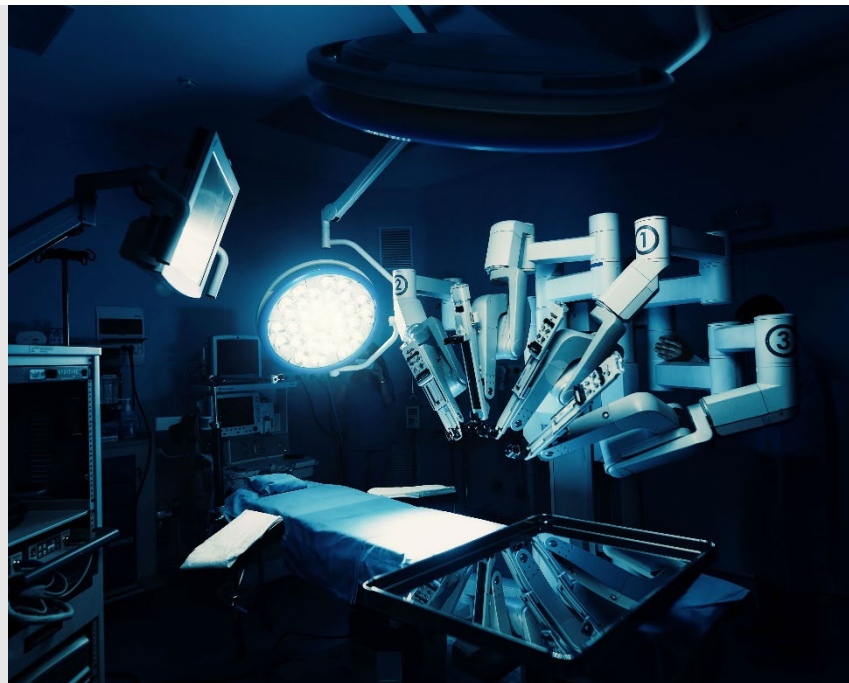


## CUSTOMER CASE IV: PIEZOSKIN, ITALY



*Nano Dimension's AME technology helped us to achieve an original product prototype, in which wires and connectors were eliminated and the package was minimized, to obtain an optimal user experience. It simplified the manufacturing process, as compared to traditional manufacturing methods.*

**Dr. Francesco Guido,**  
**CTO Piezoskin S.R.L**





## CUSTOMER CASE V: REHAU, GERMANY

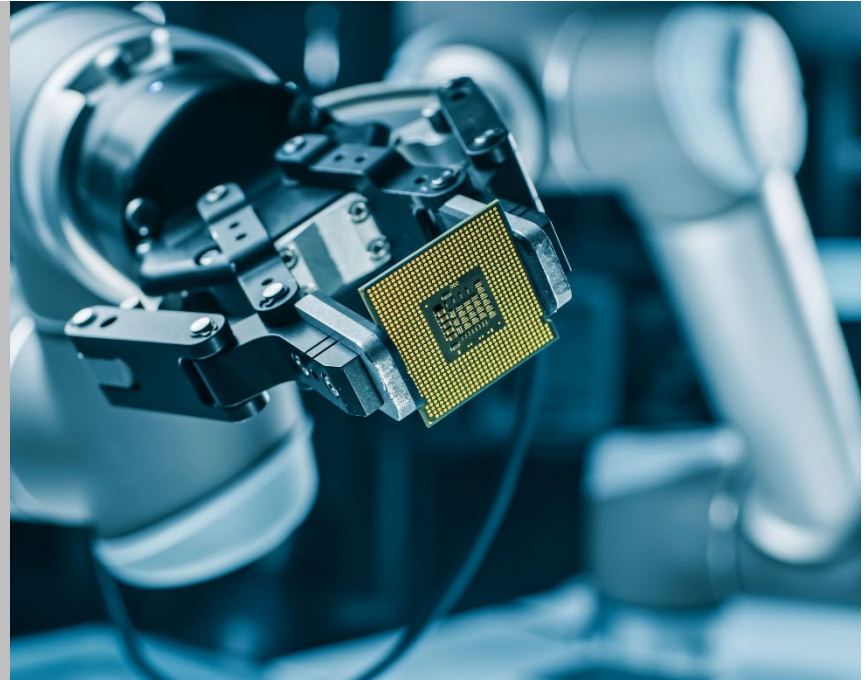
*With the DragonFly LDM we will drive forward REHAU's "Electronics into Polymers" strategy to speed up in-house electronics development and find new installation spaces and functions for our products.*

**Dr. Philipp Luchscheider,**  
REHAU Engineer behind  
the 3D touch sensor  
design



*Smartification is no longer just a vision for us. REHAU is developing improved products for the smart home and IoT environment, and Nano Dimension is providing important technology to help accelerate the availability of promising new applications.*

**Dr. Ansgar Niehoff,**  
Head of Technology  
Platform "Electronics  
into Polymers"  
at REHAU



# NANO DIMENSION MANAGEMENT



## Yoav Stern, Chairman & CEO

- President & CEO, DVTEL, Video Software company.
- Chairman, Bogen Corporation
- Executive Chairman, Kellstrom Industries
- VP, Elron Electronic, public, high-tech investments
- New York University, MA
- TAU, B.Sc. Mathematics & Computer Science
- Practical Engineering - Automation
- Air Force Academy, Graduate



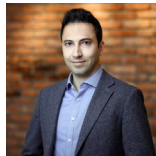
## Ziki Peled, COO

- COO/CRO of DVTEL Inc., Video Software company.
- GM Security, FLIR Systems Inc.
- President & CEO of Apollo, Defense, Energy.
- CEO of Flash Networks, Mobile Data Access Gateway.
- CEO of Bogen Communication Int'l, NJ, Germany,
- VP Elbit Systems, a multi-billion-\$ Defense Company
- GM of Elbit Communications Division,



## Yael Sandler, CFO, CPA

- KPMG
- Hebrew University of Jerusalem



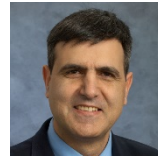
## Dr. Eli David, CTO Deep Learning & Machine Learning, DeepCube Division

- Leading AI expert specializing in deep learning and evolutionary computation.
- Published 50 papers in leading artificial, deep learning and genetic algorithms in real-world domains.
- Best Paper Award in 2008 Genetic and Evolutionary Computation Conference
- Gold Award in the prestigious "Humies" Awards for Human-Competitive Results in 2014,
- Best Paper Award in 2016 International Conference on Artificial Neural Networks.
- Developed Falcon, a Grandmaster-level chess program, 2<sup>nd</sup> in World Computer Chess Championship.
- Dr. David founded what was recognized by Nvidia as the "Most Disruptive AI Startup",
- World Economic Forum as Technology Pioneer.
- Dr. David also serves as an AI consultant to several Fortune 500 companies
- Member of Forbes Technology Council.



## Zivi Nedivi, President

- CEO Cyalume Technologies Inc., chemical-lighting solutions
- COO of Lumenis Ltd., Laser & Light energy-based technologies,
- CEO of Kellstrom, grew from \$8M to \$330M over a 5-year period
- Air Force Academy, Graduate.



## Hanan Gino, Chief Product Officer, Strategic M&A

- 23 years at Orbotech Ltd. (Nasdaq: KLAC),
  - President of the PCB division,
  - President of the Flat Panel Display (FPD) Division
- President CEO of Verint Systems Ltd. (Nasdaq: VRNT), 1,200 employees, revenue from \$200 million to \$400 million annually.
- Technion – Israel Institute of Technology, Boston University
- Israeli Air Force

# NANO DIMENSION MANAGEMENT



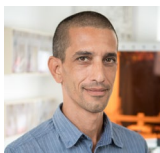
## Tamir Margalit, VP R&D

- VP R&D at Kitov.ai, a 3D inspection, robotics and AI, and before that as the
- FPD Division President and as Chief Product Officer at Orbotech Ltd.
- M.Sc. degree in Physical Chemistry from the Weizmann institute of science,
- MBA degree from Tel Aviv university.



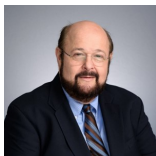
## Dr. Jon Donner, General Manager, NanoFabrica Division

- Founder of NanoFabrica
- PhD in nano optics in the group of Romain Quidant at ICFO Spain,
- Double degree from TAU in physics and electrical engineering.



## Eyal Shelef, Head of R&D, NanoFabrica Division

- HP for 16 years in R&D,
- Large industrial machines and is also an expert in developing materials and chemistry for industry.
- material research, algorithm development and process control.
- managed over 70 scientists and registered over 30 patents under his name.



## Dr. Jaim Nulman, CTO

- Applied Materials
- Cornell University
- Technion



## Michael Zimmerman, General Manager, DeepCube Division

- CEO and VP products in four start-ups which were acquired by industry leaders (AWS, VMware, Mellanox/NVIDIA).
- CEO of Bitfusion, the elastic ML/AI platform which was acquired by VMware
- GM/VP at Marvell - Networking and Compute.
- Annapurna Labs, developed high-performance distributed storage (acquired by AWS)
- Tiler, the MIT-based mass-compute company, which was acquired by Mellanox (now NVIDIA).
- Stanford Executive Program
- MS in Computer Science from NSU
- MBA, Tel Aviv University and a
- BScEE (Summa Cum Laude), Tel Aviv University.



## Eri Rubin, Head of R&D, DeepCube Division

- 15+ years of experience working in the field high-performance computing for deep learning,
- Large-scale AI deployments requiring GPU, CPU x86 and ARM, and ASICs.
- Researcher and developer in the fields of computer vision and computer graphics.
- MA with honors in Computer Science, Hebrew University, massively parallel high-performance computing.



# APPENDIX 2



NASDAQ: NNDM

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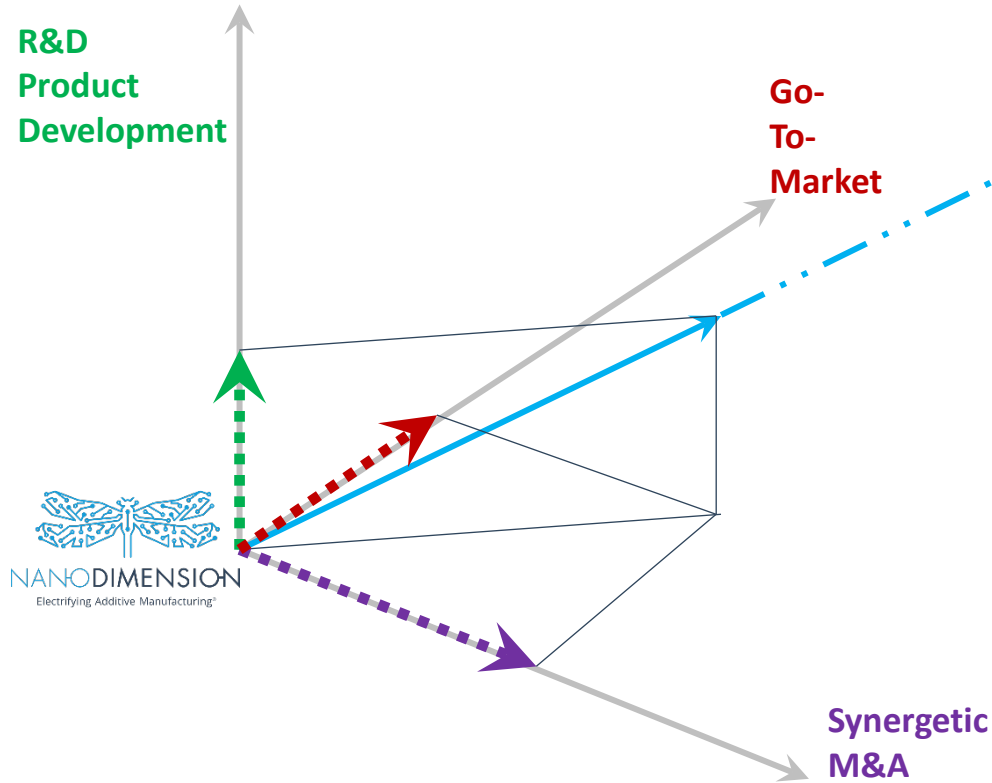


@3Dpcb

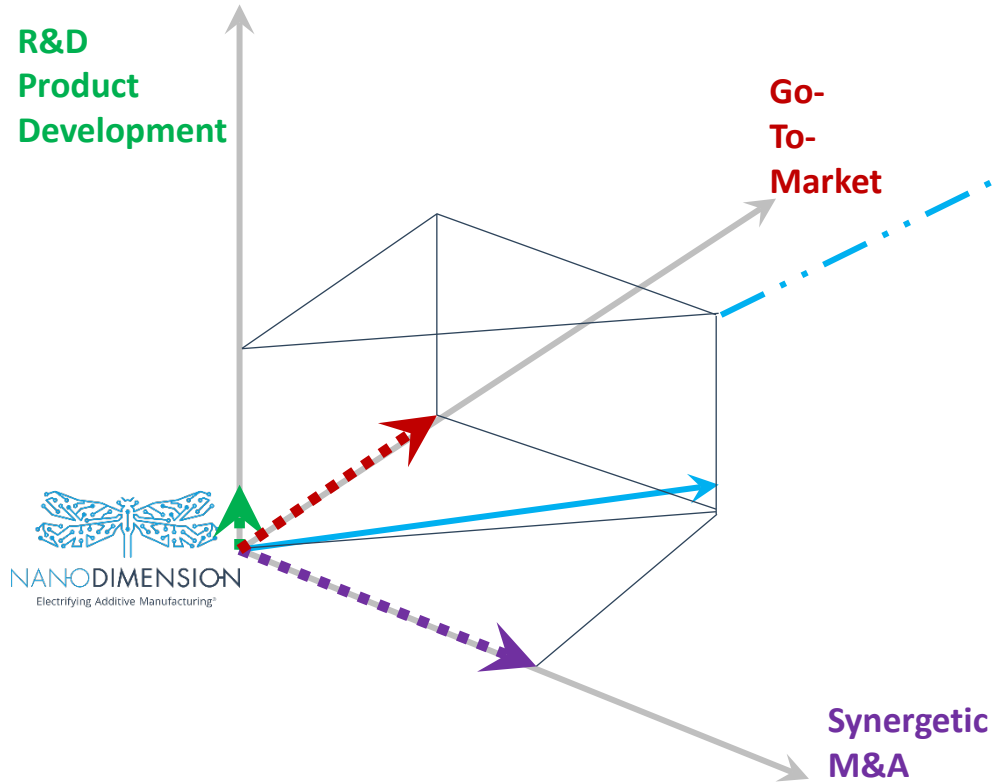


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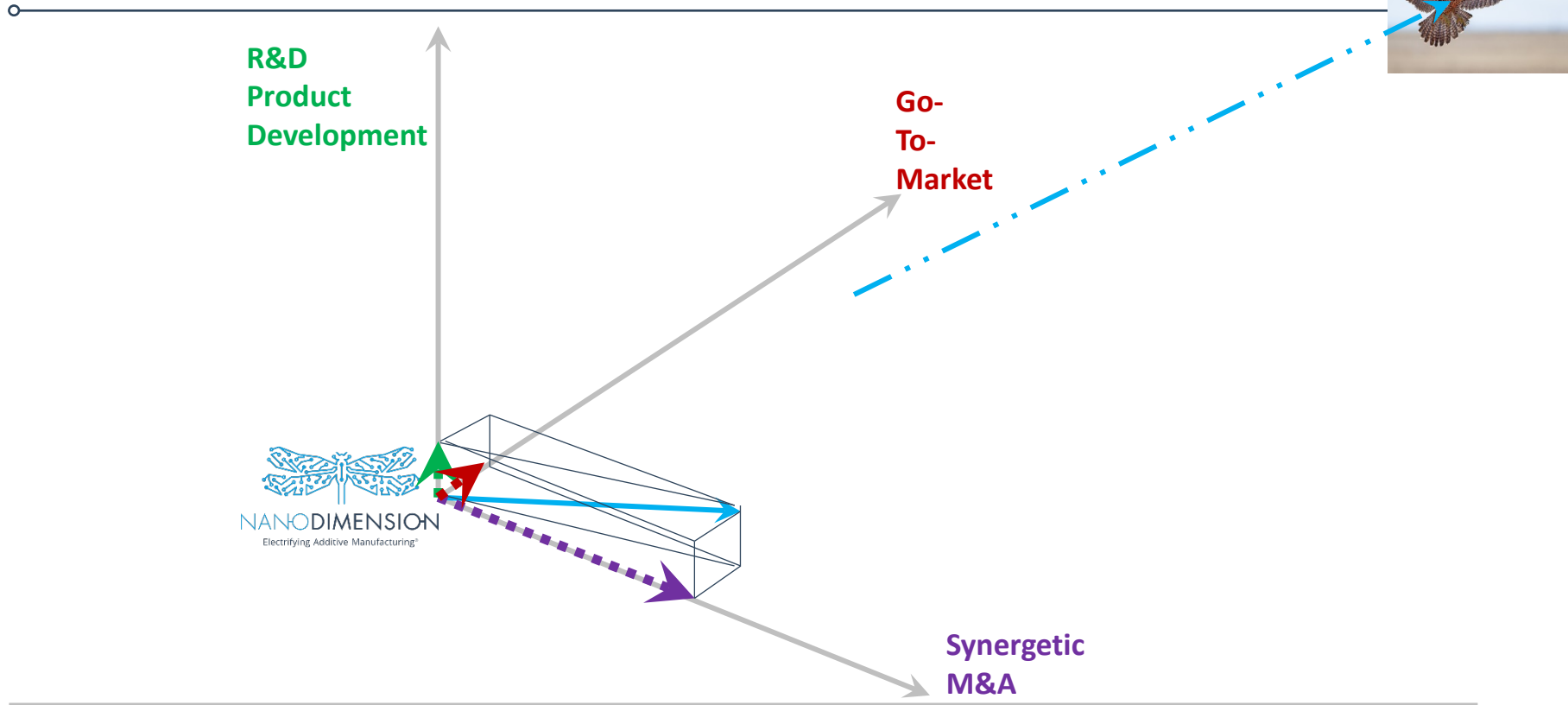
# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY



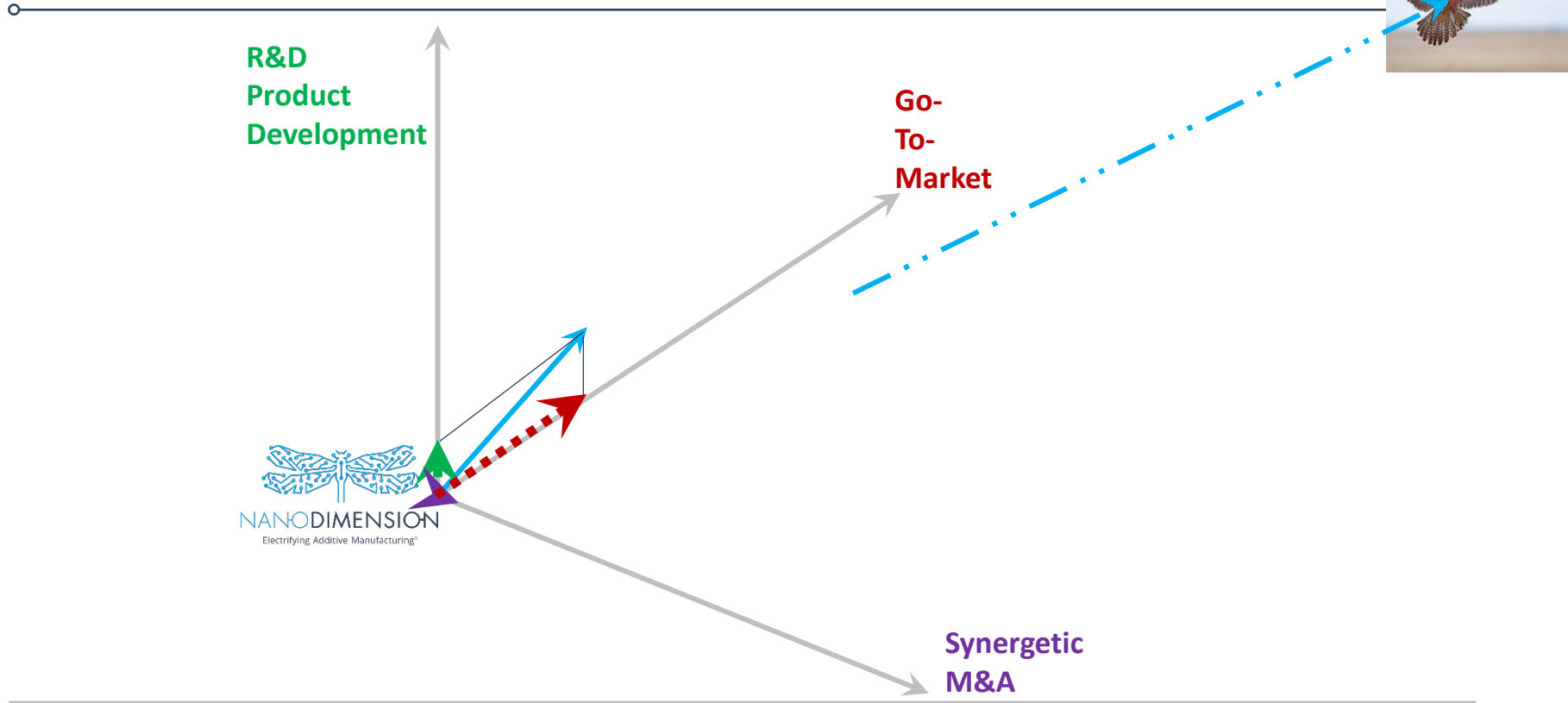
# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY



# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY

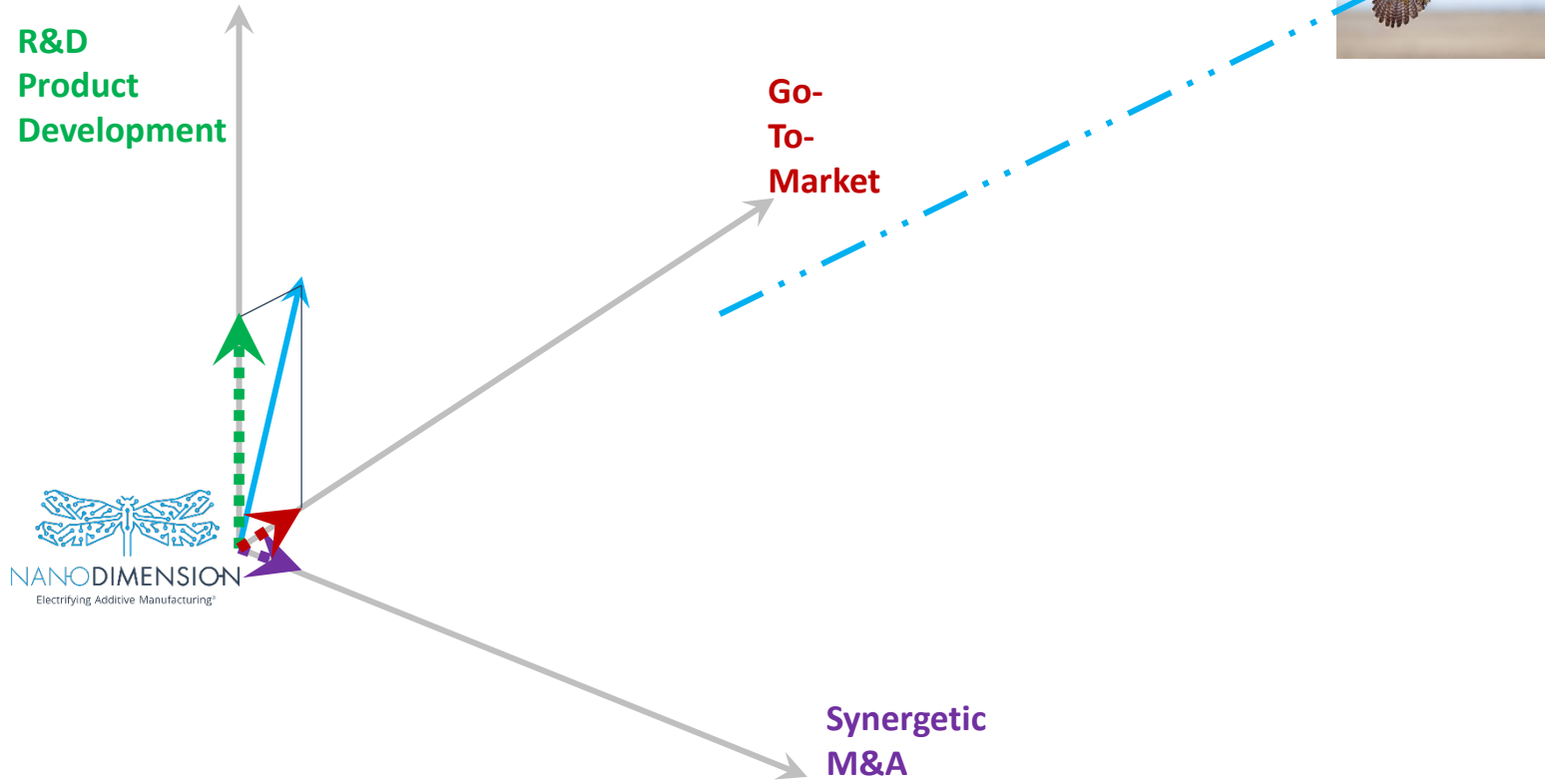


# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY

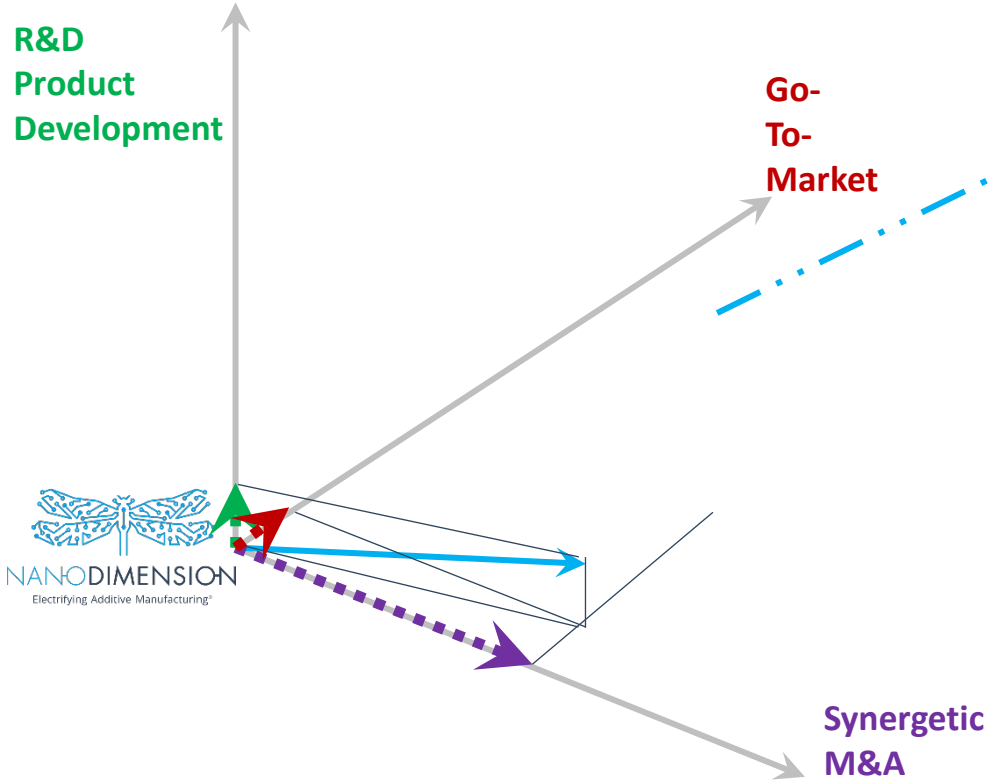




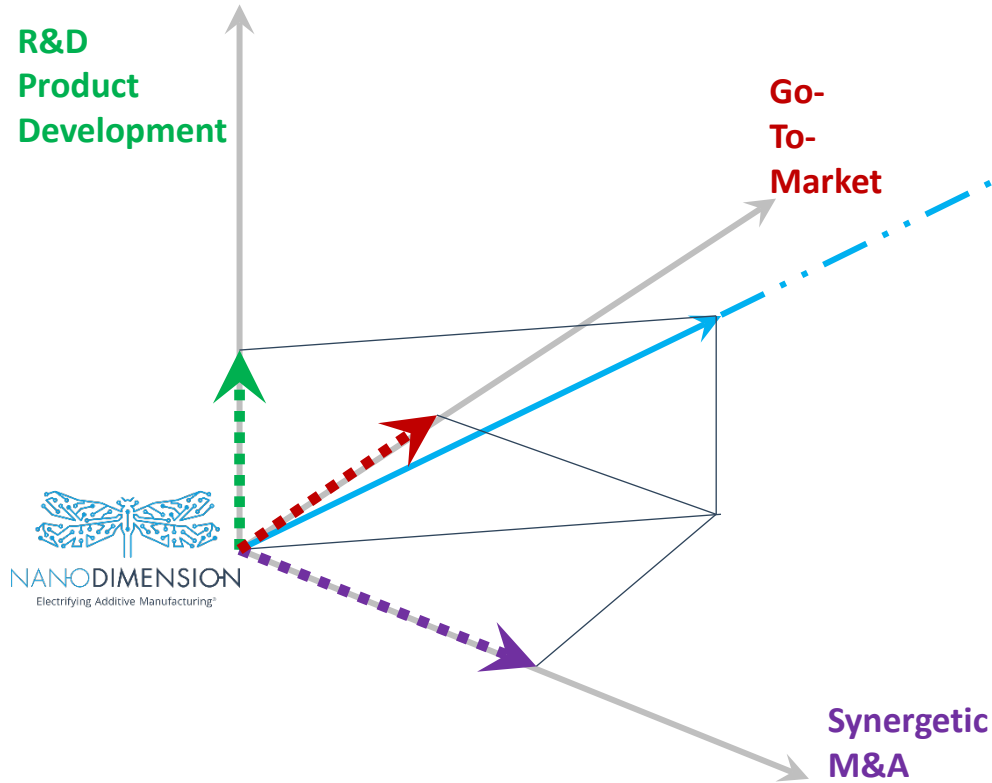
# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY



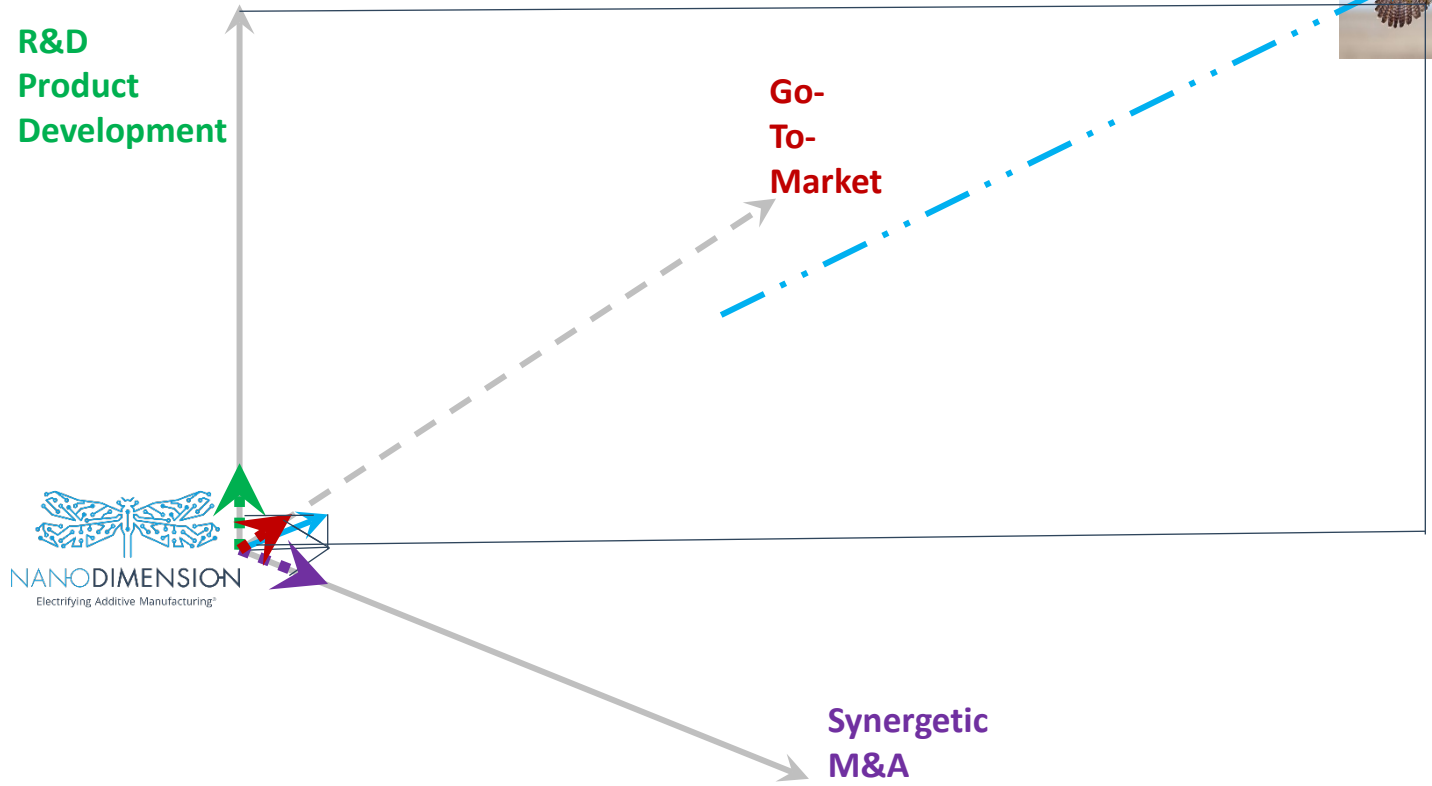
# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY



# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY



# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY



# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY

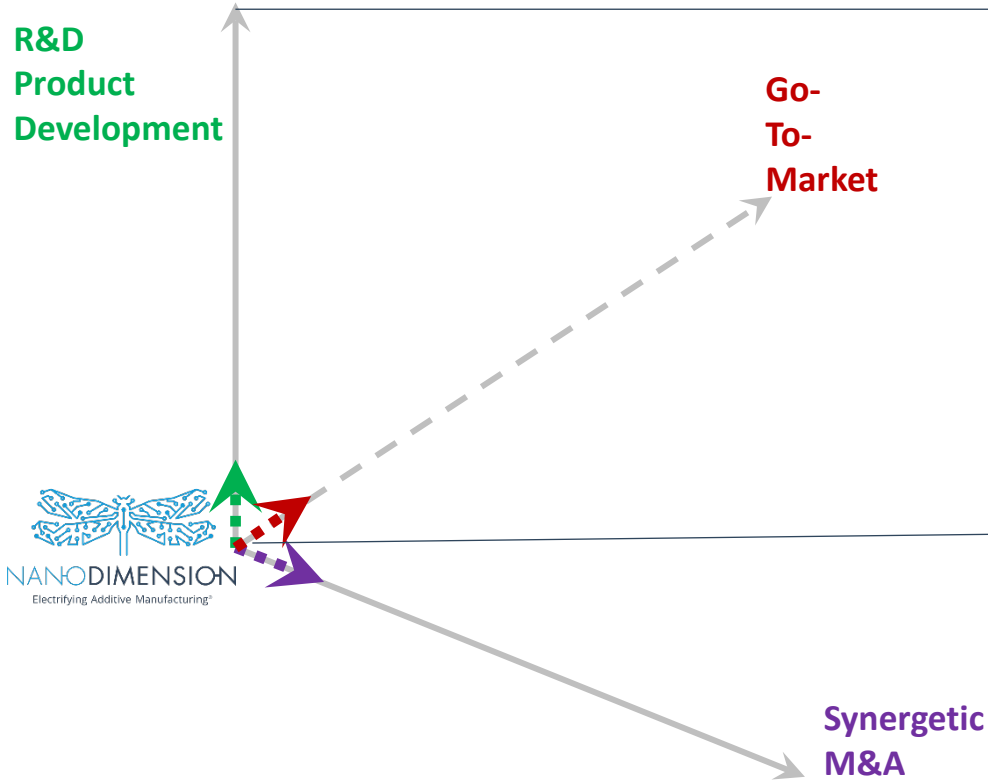
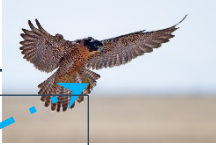
**R&D  
Product  
Development**

**Go-  
To-  
Market**

**Synergetic  
M&A**



# MULTI-DIMENSIONAL BUSINESS DEVELOPMENT STRATEGY



# APPENDIX 3



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# CERTIFICATIONS



CE

FCC



EAC

In-house DragonFly system  
manufacturing  
FCC, CE, UL, CSA, EAC

In-house nano ink manufacturing  
–  
capacity to meet future demand

Top quality certified  
ISO14001 and OHSAS18001  
ISO 45001 and RoHS



# NEW MANUFACTURING POSSIBILITIES WITH THE DRAGONFLY LDM

## High-Performance Electronic Devices™ : Hi-PEDs™

### RF AMPLIFIER FOR SPACE

- Light weight
- Integrated design
- < 1db gain difference

### RAPID PROTOTYPING INHOUSE

- Months > days
- Dozens of layers, both sides populated



### PRINTED CAPACITORS

- High Accuracy Capacitors Integrated in the board
- 50 layers

### INNOVATIVE MEMS PACKAGING

- Embed piezoelectric transducers
- Compact, lightweight and robust package

**DRAGONFLY LDM**  
“Lights Out” Digital Manufacturing

# VISION: BRIDGING THE GAP

## DragonFly LDM & Ink Materials

Design → Proof of Concepts →  
Prototype & Early Fabrication of  
HiPEDs™ (High Performance Electronic  
Devices)

**TRADITIONAL  
INTEGRATED CIRCUITS**  
*(IC, Chips, CPU, ASICs)*

## AME TECHNOLOGY



**TRADITIONAL PRINTED  
CIRCUIT BOARDS (PCB)**



# NANO DIMENSION OFFERING

## AME 3D-PRINTING SYSTEMS

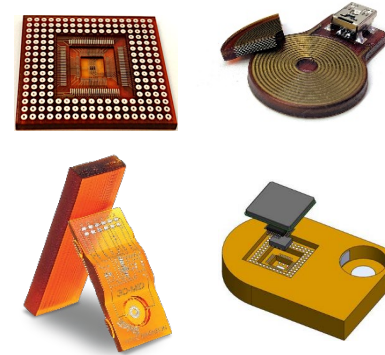
DRAGONFLY LDM, DRAGONFLY LDM 2.0



- System
- Training and Support
- Leasing Options

## NaNoS®

3D FABRICATION SERVICE



- Co-creation / Design
- Prototyping
- Low Volume Production

# PRODUCT POSSIBILITIES WITH 3D ELECTRONICS

Real 3D Embedded Electronics for Heterogenous Integration

Electronics integration (MEMS, Sensors, Transistors, ICs, Opto, Piezo, Chem-Electro, Magnetics, Motion)

3D Printed Electronics Components (Capacitor, Inductor, Transformer, Antenna)

**AME Hi-PEDs™**



*beyond traditional manufacturing*

Multi Stacking ICs, Packages, Side Mount & Contacts, Free Form of Vias

Non Planar Shape and 3D Structural Elements (Cavities, Special Shapes)

High Layer Count Circuits > 50

RF&MW Embedded Components

Converter and Chargers (DC, AC)



# MOVING INTO THE FUTURE

## RAPID PROTOTYPING

**Benefits:** Shorten your Time-to-Market, reduce cost and increase innovation with agile prototyping and fast feedback cycles

- Reduce development time
- Reduce prototyping and R&D cost
- Inhouse, print designs over night
- Full confidentiality / IP protection
- Test many designs for more functions
- Reduce cost of error

## ADVANCED PRODUCTS: HIPEF FABRICATION

**Benefits:** Produce better, lighter, cost-effective products by eliminating assemblies and improving the performance in 3D forms

- Produce complex 3D circuits and optimize form factor (SiP, Heterogeneous Integration)
- Reduce assembly steps by printing components
- Reduce size and weight of products
- Improve products performance

## DIGITAL INVENTORY

**Benefits:** The future will allow business models based on part licensing. Eliminate the need of sending physical parts

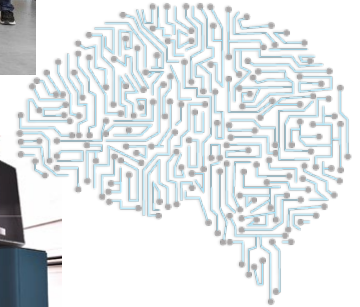
- On site per demand production of spare parts
- No tooling cost
- Eliminate stock and free up working capital
- Changing the paradigm of electronics production
- Reduce environmental waste

TODAY

TOMORROW →

## STRATEGIC ACQUISITIONS – APRIL 2021

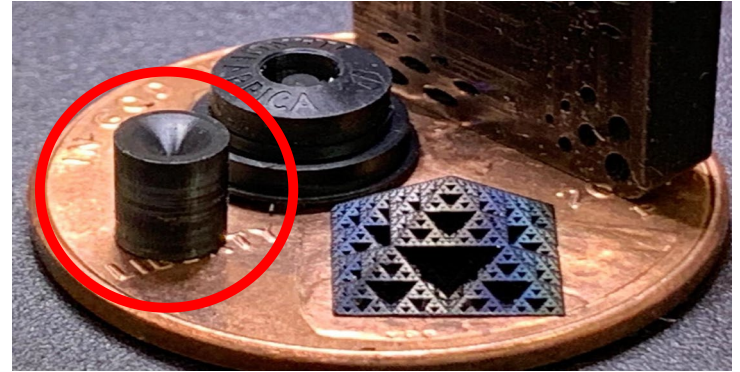
- Nano will leverage its strong financial position for even greater success through a strategic investments program.
- Recent investments include:
  - **DeepCube** - a world leader in Machine Learning/Deep Learning (ML/DL) technology.
  - **Nanofabrica** – an additive manufacturing leader of precise and complex parts.
- More acquisitions to come that will drive a revolution in the electronics manufacturing industry



# MEDICAL DEVICES – NEURALINK (ELON MUSK)



*“Part arrived and it looks awesome”*



## INJECTION MOLDING – OPTICAL CONNECTORS



“ (Nanofabrica’s tech) could be a game changer for us  
Reducing lead time from 4 months to 1 day”

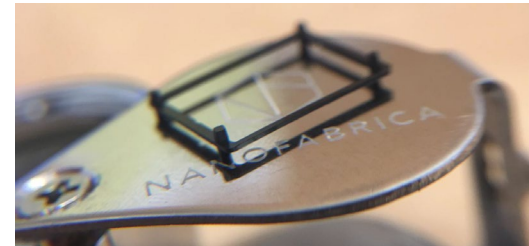
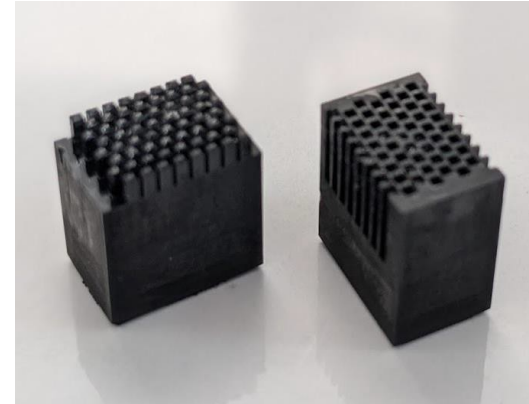
Sr. Director HW

“ A mold for a large connector with micron precision elements can cost \$500K!  
Your mold can eliminate this cost”

“I looked at the parts you had shipped...  
they look fantastic”

Principle Eng. Advance tech

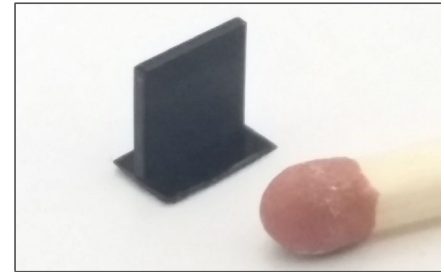
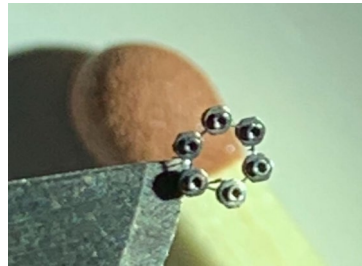
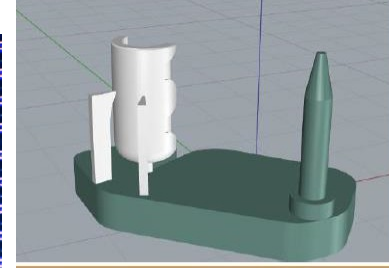
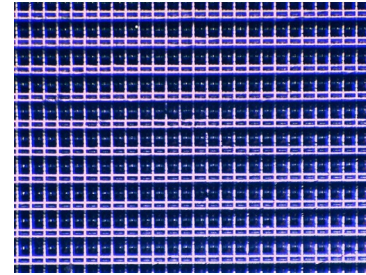
(TE is a Swiss / US listed company, \$12Bn revenue, sensors & connectors)





# MEDICAL DEVICES MINIATURIZATION

- working with principal scientist Phillips innovative technologies
- 3 projects:
  1. “miniature factory”
  2. Optical connectors
  3. High performance X-ray element



## INJECTION MOLDING – AGRICULTURE

Setting up a new manufacturing line cost \$3M  
...Nanofabrica can remove this risk”

Esteban R. VP R&D

### Customer: INJECTION MOLDING – PRECISION MANUFACTURING (BETA #3)

“I have been following precision  
AM market for years, and am  
excited about the level you  
(Nanofabrica) has reached”

VP Marketing & Customer Strategy



(Israeli, recently sold to Orbia for  
\$1.5Bn, agriculture / injection  
molding )



““it's astonishing how good your mold is..totally crazy how detailed”

“a mold within 1 hour that has a 1 $\mu$ m resolution is a game-changer”

Lead of AM molding project

(Swedish, traded, \$3Bn, leader in polymer and specifically rubber products)



## CUSTOMER QUOTES

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*"You push the industry, a mold within 1 hour that has a 1-micron resolution is a game-changer, well done."* AM Engineer

**SAMSUNG**

*"The parts look impressive."* Optical Eng.



*"(Nanofabrica's tech) could be a game changer for us."* Sr. Director HW



*"your tiny feature capability is very relevant to some of our engineering challenges"*  
*"Part arrived and it looks awesome"* Mechanical Eng.

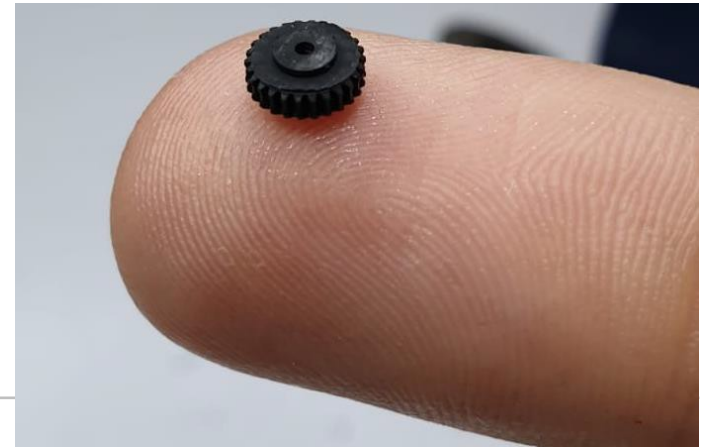
“we have many sensors a year but in short runs of 1000 each. NF can make this much more cost effective”

“Head of portfolio management”



## MECHANICAL PARTS

“...The gears are working, and lifetime looks also good.” / Head of AM



# PRODUCT MARKET FIT

LEAD GENERATION

POC

Betas / LOI



GE Healthcare

Kulicke & Soffa



Government Agency

JABIL OPTICS

Johnson



IBM

Medtronic

Thermo Fisher SCIENTIFIC



Johnson & Johnson

flex.



+370

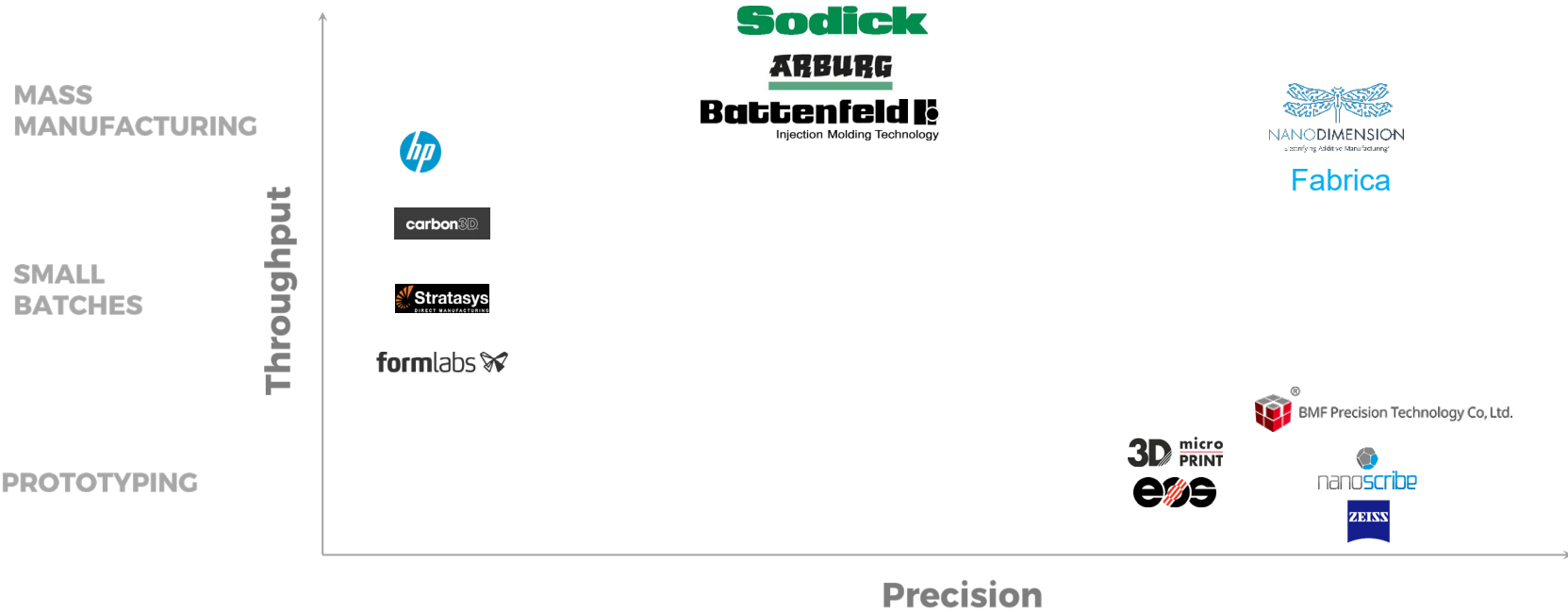
+50



NANO DIMENSION  
Electrifying Additive Manufacturing™

# COMPETITION

Other companies: Old World Labs, Multiphoton optics, Microlight3D



# SYNERGIES

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## **Commercial**

- GTM / Sales – Customer overlap, up sale, distributors
- Miniaturization – High performance industry leadership
- Manufacturing center – Full solution, multi-knowhow

## **Technological**

- Joining tech to enable miniature Hi-PEDs
- Industrial speed AME by local sintering based on Nanofabrica system and knowhow



# THERE IS AN ELEPHANT IN THE ROOM

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## CORONA IS AFFECTING BUSINESSES IN 2020-21

WORKING ASSUMPTION: AT LEAST UNTIL Q3/2021

All present customers were out-of-office until July 2020.  
Some until now. (Mostly USA)

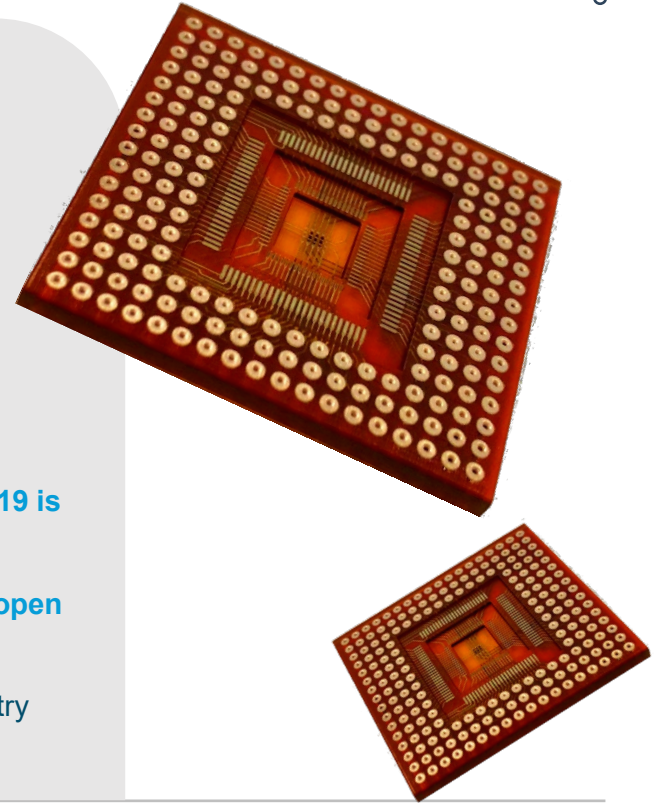
- Chinese companies returned on 10/2020 **but** still delaying all purchases of Capital Equipment.
- European business in 02-2021 **but** delayed most CapEx deployments.
- USA corporations projected June 2020 as “back-to-business” **but** changed to July, and then changed to “maybe early or later 2021”
- Most customers (especially in USA) are in discussions, **but** no suppliers’ visits for maintenance until further notice. Hence: No installations are possible.
- And: Many DragonFly labs were shut down until Corona subsides, with no confirmed date.
- Europe experiencing the 2<sup>nd</sup> and 3<sup>rd</sup> wave 10/2020 – 04/2021.



# PRESENT INVESTMENT THESIS IS NEW

## PLAN FOR 2021: RIDING THE ELEPHANT

- Started a Prototyping/Fabrication Services Business:  
**NaNoS (Nano Services)**
- **Expand NaNoS as revenue generator**, but mainly as a route for DragonFly purchases once CapEx are released post Corona
- M&A search directed at targets that will enable to **leverage NaNoS**
- **INVEST HEAVILY to preempt seeds of competition: Product & technology leapfrog toward production machines (DragonFly LDM 2.0 & NextGen)**
- **Minimal investments in sales & marketing (other than NaNoS) until COVID-19 is over!!!**
- **There is no reason to drill in a dry field. The rich grounds is expected to reopen in 2-4 quarters.**
- **CONSERVE CASH>> ACCELRATE TECHNOLOGICAL EDGE** to create “Industry 4.0” Tectonic Shift.



# APPENDIX 4



NASDAQ: NNDM

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## POST CORONA WORLD: MOVING SUPPLY CHAIN 'IN HOUSE'

“Even as China comes back online, we are beginning to wonder if Covid-19 will impact other supply-oriented geographies...

...While China is improving, **the supply chain for the electronics industry may yet see substantial disruptions....**

...*Mass assembly is only one part of Apple's supply chain.* The company and its many partners spend months years sourcing individual components that are or assembled into final products. Any **disruptions** in this complex network could **slow the introduction of future devices.**” (Bloomberg)<sup>1</sup>

Sources:

1) Gurman, Mark, and Debbu Wu. "https://www.bloomberg.com/amp/news/articles/2020-03-19/apple-s-supply-chain-woes-linger-even-as-china-recovers." Bloomberg.com, Bloomberg, 19 Mar. 2020.  
www.bloomberg.com/amp/news/articles/2020-03-19/apple-s-supply-chain-woes-linger-even-as-china-recovers



# POST CORONA WORLD: MOVING SUPPLY CHAIN 'IN HOUSE'

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## **OCTOBER 12th, 2020: The American Dream: Bringing Factories Back to the U.S.**<sup>(1)</sup>

A report from the McKinsey Global Institute found “180 products across value chains for which one country accounts for 70% or more of exports, creating the potential for bottlenecks.” Worse, many of those products come from an increasingly hostile China, a circumstance with profound national-security implications for the U.S. and other democracies.

- Investors stand to benefit if reshoring means a longer-term revival in innovation and flexibility in production. And higher operating costs could be offset by higher revenues, whether that’s through higher wages leading to greater consumer demand, government support, or some combination.
- Both presidential candidates want to bring manufacturing back, but their strategies differ. Democrat Joe Biden has unveiled a plan to boost federal spending on U.S.-made goods, support research and development, change the tax code to discourage offshoring, and close loopholes in rules that already require Uncle Sam to “Buy American.”
- While Silicon Valley is now known for software, it originally prospered as a manufacturing center that supported fundamental scientific research in physics, electronics, and materials science. Many of the world’s leading electronics hardware companies are still headquartered in Silicon Valley, but most don’t manufacture anything there.
- Bringing manufacturing back to America isn’t impossible by any means—especially in capital-intensive sectors such as electronics ....It may even benefit investors...
- “What’s missing is the capability to pivot” to sudden changes in demand.”<sup>(2)</sup>

Sources:

1) Matthew C. Klein, *Barrons*, Updated October 12, 2020 / Original October 9, 2020, <https://www.barrons.com/articles/the-american-dream-reshoring-manufacturing-51602270001>

2) Erica Fuchs, professor of engineering and public policy at Carnegie Mellon, <https://waysandmeans.house.gov/sites/democrats.waysandmeans.house.gov/files/documents/Erica%20Fuchs%20Testimony.pdf>

## POST CORONA WORLD: MOVING SUPPLY CHAIN 'IN HOUSE'

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- "The global **supply chain right now is disrupted**; we are seeing disruptions across the board... the high-tech industry is heavily reliant on China and parts of Asia." (Bloomberg)<sup>2</sup>
- "...heat from the Trump administration's 25% tariffs on many machinery parts from China, as well as rising political tide in America to bring industrial production of things such as **electronic circuit boards closer to home**.... Now with the coronavirus, he said, "there will be changes." (LA Times)<sup>3</sup>
- A recent **BofA survey**...wide...remapping of supply chains. 3,000 firms...in 10 out of 12 global industries, including **semiconductors, autos and medical equipment...shift, at least part of their supply chains from current locations**....
- Masterwork contracts with about 100 factories in China. Before the virus outbreak, the company could place an order and have it confirmed in two to four days. **Last month...it was taking two to three weeks — couldn't say when the products would be shipped.**
- "...industries will probably accelerate moves to **localize supply chains**, so they're more closely tied to final markets as opposed to extending them farther out."(LA Times)<sup>3</sup>

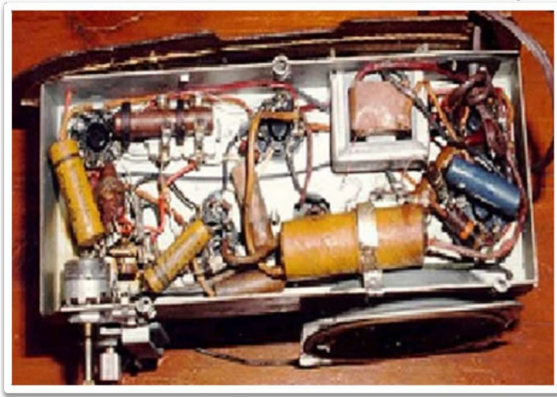
Sources:

2) Chang, Emily. "Supply Chain Expert on Coronavirus Impact." Bloomberg, 17 Mar. 2020, [www.bloomberg.com/news/videos/2020-03-17/supply-chain-expert-on-coronavirus-impact-video](http://www.bloomberg.com/news/videos/2020-03-17/supply-chain-expert-on-coronavirus-impact-video). Accessed 25 Mar. 2020.

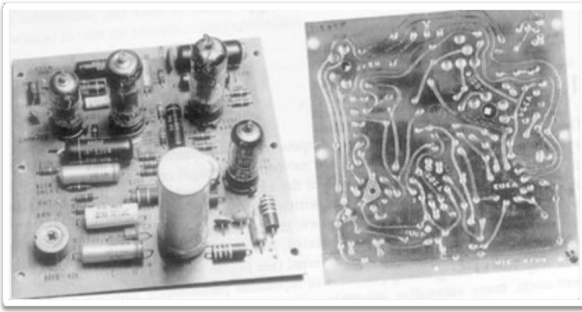
3) Lee, Don. "As Coronavirus Cripples Global Supply Lines, More U.S. Firms Looking to Leave China." Los Angeles Times, Los Angeles Times, 4 Mar. 2020, [www.latimes.com/politics/story/2020-03-04/spreading-coronavirus-tears-apart-global-supply-chains](http://www.latimes.com/politics/story/2020-03-04/spreading-coronavirus-tears-apart-global-supply-chains).

# TRADITIONAL PCB HISTORY

Pre-PCB electronic circuit with rat's nest wiring.



Early PCB



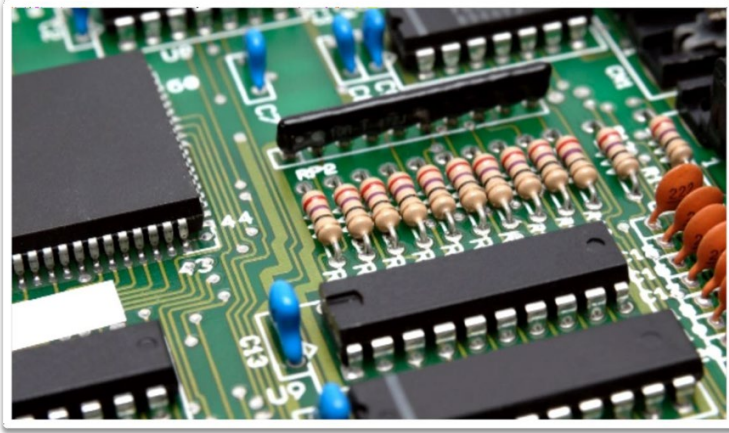
Before the 1950s, **electronic circuits were assembled using individual wires to connect each of the components** (Pic 1).

The components were then mounted on what were known as tag strips and sockets. The **first circuit boards were made by laminating an insulating material around 1.6mm thick with copper foil**. Holes were drilled for the components and the component leads were soldered onto the copper foil, using the copper to create an electrical connection between the components.

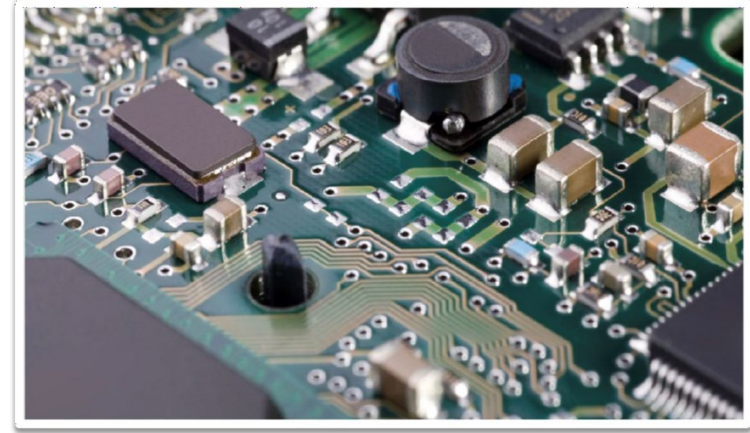
**Dr. Paul Eisler**, an Austrian scientist working in England, is credited with **inventing the first single-sided PCB**. Based on Eisler's early work, single-sided boards were commercialized during the 1950s and 1960s, primarily in the United States.

# TRADITIONAL PCB MOUNTING

Through-Hole Electronics



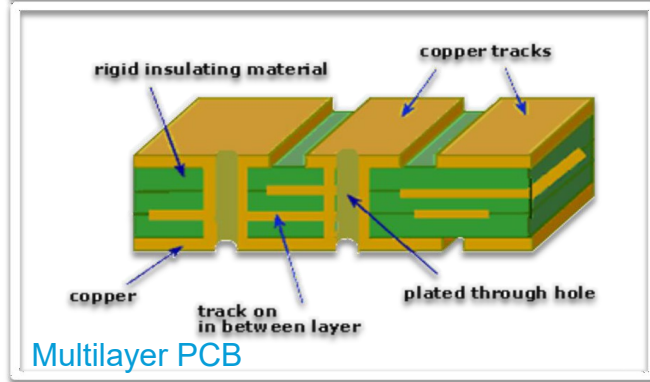
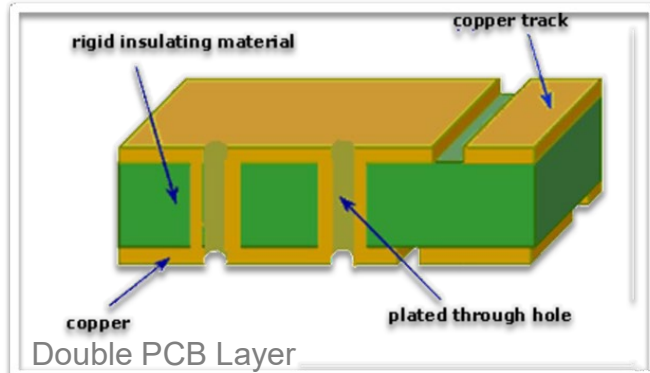
Surface Mount Electronics



The vast majority of electronic circuits are now made using Printed Circuit Boards (PCBs). These are copper-clad fiberglass or epoxy boards that have the copper selectively etched away to leave conductive traces. Components can be mounted through drilled holes (left) or on the surfaces of the boards (right).



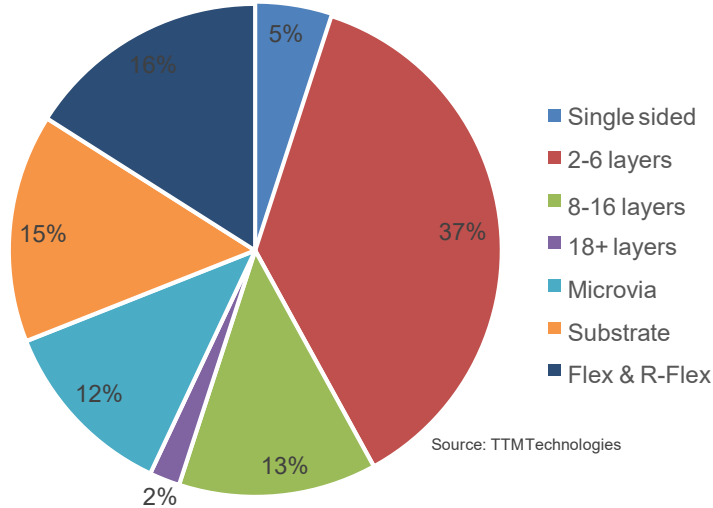
# PCB VS. AME



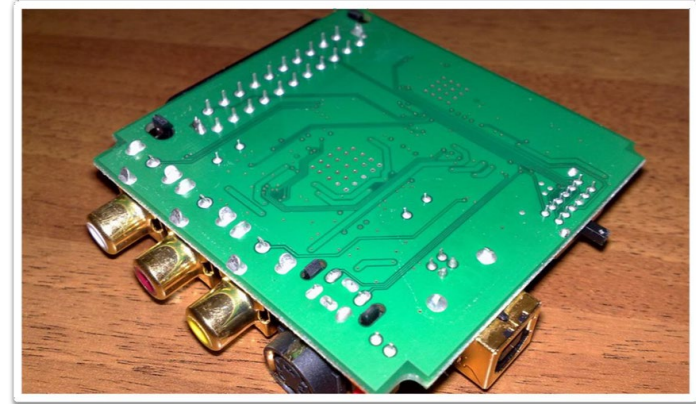
- **Single-sided PCBs** are very limiting in terms of connection topology. With single-sided PCBs, most circuits require the ability to join two conductive tracks using a wire.
- **Double-sided PCBs** alleviate this problem by allowing connections through holes from one side of the PCB to another.
- **Multi-layer boards** take this further by providing up to 52 layers with connections between arbitrary layers. Such a large number of layers clearly represents a shift towards 3D printed electronics.

# TRADITIONAL PCB LAYERS

World PCB production by type



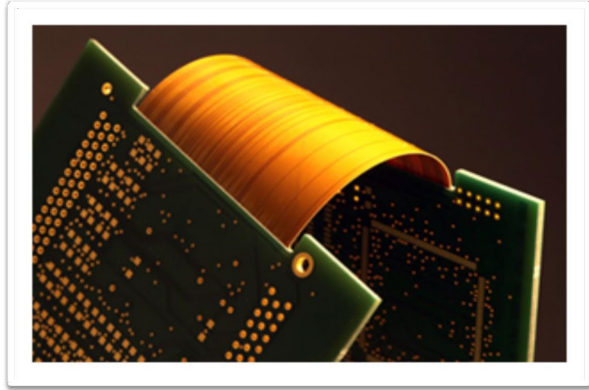
According to TTM Technologies, the most common PCB type is 2-6 layers with 37% share of the total market. Therefore, **multilayer boards will be the largest addressable market** for PCB rapid prototyping technologies such as 3D printed electronics.



Many PCB designs, particularly analog or high-frequency digital circuits, employ a ground plane. This is a **large area of copper foil** that provides a **low resistance connection** to a reliable ground voltage and some protection from EM interference.

Consequently, PCB designs often employ more than one layer.

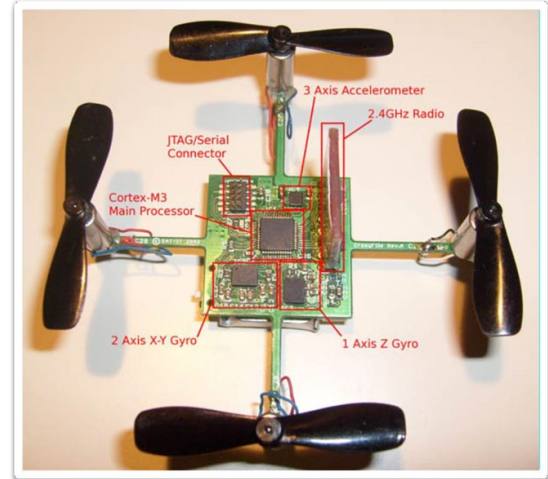
## TRADITIONAL PCBs: MECHANICS



Rigid PCBs can be connected together using flexible interconnects to offer a bit more design freedom but the physical limitations are obvious, particularly in the light of massive emerging markets like wearable technologies.

The physical strength of fiberglass board makes it possible to use a traditional PCB as a mechanical component in a device as well as an electrical one. This is a crude form of structural electronics.

The CrazyFlie quadcopter shown above uses its traditional PCB as a chassis providing all of the power and control electronics as well as electrical and mechanical connections to each of the four motors.



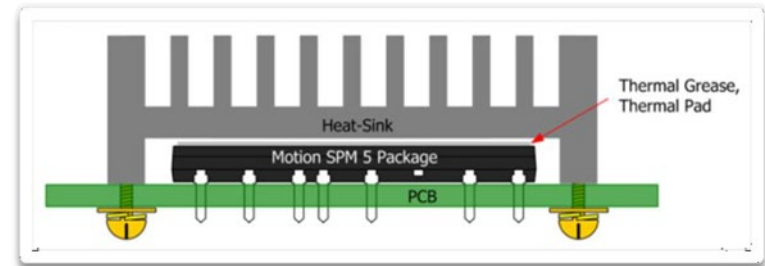
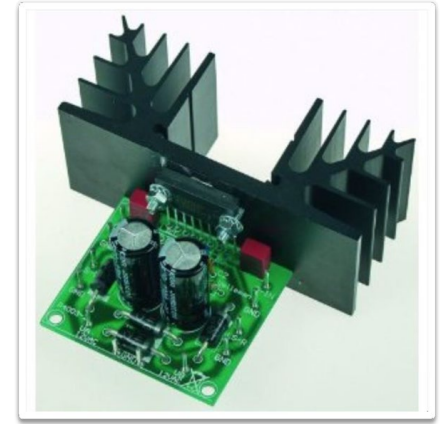
## TRADITIONAL PCBs: HEAT

Components such as power semiconductors can generate a lot of heat that must be dissipated in order to keep the device running within temperature tolerances. Temperature is responsible for 55% of all electronic circuit failures. Specifically, the failure rate of an electronic device doubles with every 10°C increase in chip junction temperature<sup>†</sup>. The ability to transfer and dissipate heat generated at the chip level directly dictates the system's reliability.

Heat dissipation is traditionally accomplished by using a thermal interface material to join the power semiconductor component to a heat sink, often on the opposite side to the PCB. In some cases, vias are used to help conduct heat through the PCB.

Fiberglass and epoxy are the standard substrates used in PCBs. These materials are thermal insulators and, therefore, do not help to conduct heat away from components. Ceramic fillers such as Beryllium Oxide (BeO) are used to improve thermal conductivity whilst retaining electrical insulation, but the poor thermal conductivity of most PCBs is still a significant issue.

Heat management is one area where alternative technologies may be able to improve upon the traditional PCB.



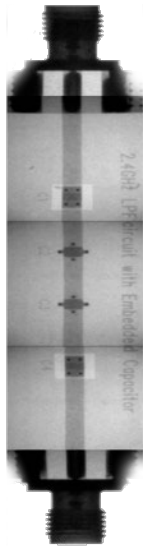
# PCBs SWOT ANALYSIS

Strengths	Weaknesses
<ul style="list-style-type: none"><li>• Established technology: ~\$60bn industry.</li><li>• Physically strong.</li><li>• High electrical conductivity (<math>\sigma = 5.96 \times 10^7 \text{S/m}</math>) from solid copper traces typically 36<math>\mu\text{m}</math> deep facilitates analog and high-frequency digital circuits.</li><li>• Can withstand temperature extremes, humidity, mechanical shock and vibration, atmospheric variations, harmful chemicals, and electromagnetic radiation.</li><li>• Ground plates are cheap.</li><li>• Multilayer boards are commonplace.</li></ul>	<ul style="list-style-type: none"><li>• Either expensive to prototype locally or slow to prototype remotely (7 to 21 day turnaround from China).</li><li>• Cost single unit cost due to minimum batch size: ~\$50 for a 6"x5" multilayer board.</li><li>• Poor thermal conductivity of the fiberglass or epoxy substrate creates heat management problems.</li><li>• Etching uses hazardous chemicals that are very bad for the environment to the extent that the world's largest PCB manufacturer, China, have outlawed etching in coastal regions.</li></ul>
Opportunities	Threats
<ul style="list-style-type: none"><li>• Some potential to include components like supercapacitors inside the PCB.</li></ul>	<ul style="list-style-type: none"><li>• Flexible circuit boards.</li><li>• Printed conductive inks and pastes.</li><li>• 3D printed electronics.</li></ul>

# EXAMPLE OF Hi-PEDs™ : LOW PASS FILTER (LPF)



Printed LP

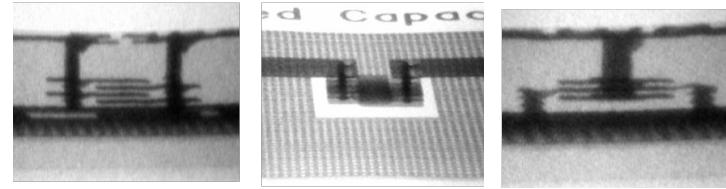


X-ray of  
Printed LP

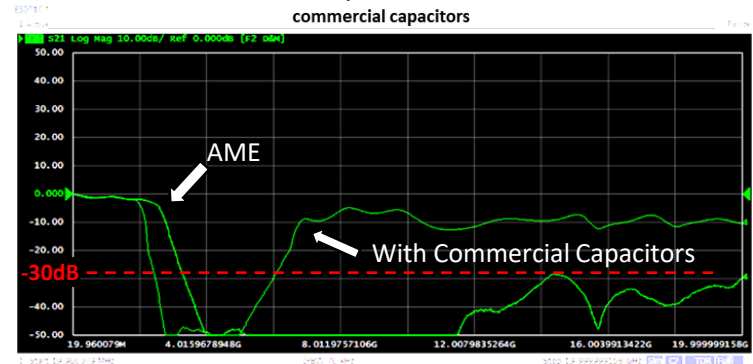
LPF uses AME capacitors fabricated simultaneously inside the AME board together with strip lines.

The AME capacitor and the strip line can be placed on any layer or on different layers in the AME board

X-ray of LPF capacitors and transmission strip lines



S21 - AME transmission and capacitors vs AME transmission with SMT commercial capacitors

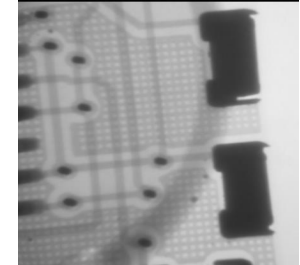
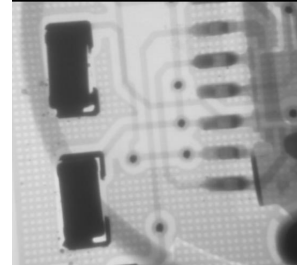
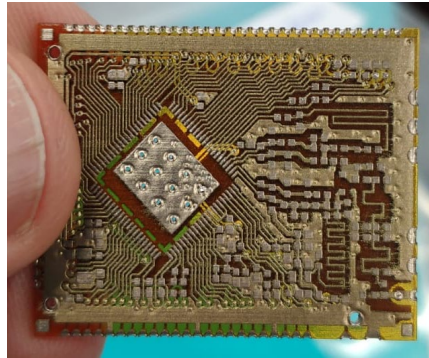
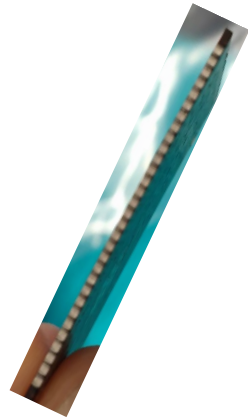
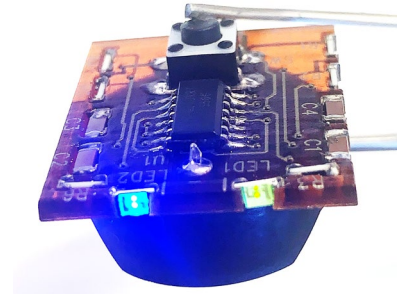


LPF with AME Capacitors filters the signal at least up to 20GHz. (less than -30db)

LPF with Commercial Capacitors stops filtering at 6GHz

## EXAMPLE OF Hi-PEDs™ : SIDE MOUNT/CONTACT AND INSERTED COMPONENTS

- Enables the use of an area not common for PCB components
- Enables the creation of customized small PCBs that can be inserted into a socket

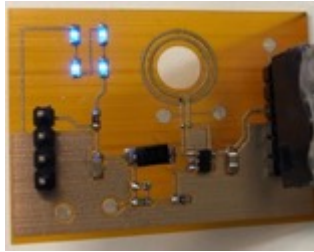


a)

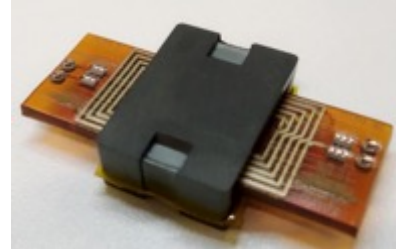
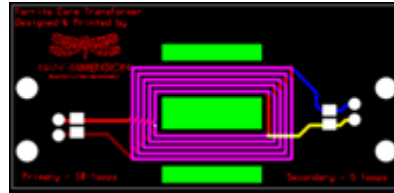
b)

Figure 1 X-ray view of a) inserted, and b) side mounted components soldered to vertical contacts manufactured as part of the PCB additive manufacturing technology in the DragonFly LDM™

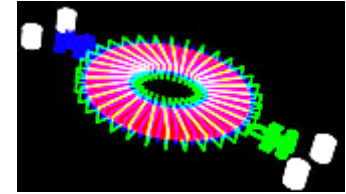
# EXAMPLE OF Hi-PEDs™ : BUILT IN POWER TRANSFORMERS



**In Board Power  
DC-DC Up  
Voltage  
Converter**



**AC-AC  
Transformer with  
ferrite core**



**AC-AC Up  
Converter (x10)**



# End



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