NANODIMENSION

ADDITIVE MANUFACTURING FOR PROFESSIONAL ELECTRONICS

Transforming a concept into a market-ready electronically functional object is a real challenge for designers, engineers, prototyping teams, and CEOs. This is especially true for the highly competitive electronics industry, where product complexity is continuously increasing in line with the trend towards smaller packages, thinner devices, and higher functionality. To stay competitive, companies not only need to develop more innovative products, but they also need to prepare for the reality that product lifecycles are constantly decreasing.

TOP CHALLENGES IN ELECTRONICS DESIGN

In a survey conducted by the Aberdeen Group, increased product complexity was the main focus of PCB designers, while improved time-to-market was identified as a primary business objective, ahead of the need to reduce product cost and improve product quality (See Figures 1 and 2). Time-to-market is a summation of the time required for the Printed Circuit Board (PCB) to be sent for outsourcing and back for concept validation and rapid prototyping. The survey shows that electronics design and development companies need product development cycles that are shorter, more agile and efficient. In addition, decisions need to be made in the early stages of the product development cycle to avoid costly mistakes and rework in the process. Internal ordering procedures often add days or weeks to this cycle time.

Figure 2: Top Challenges in PCB Design

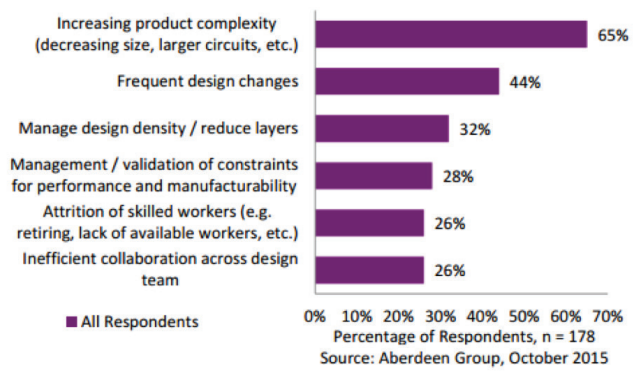
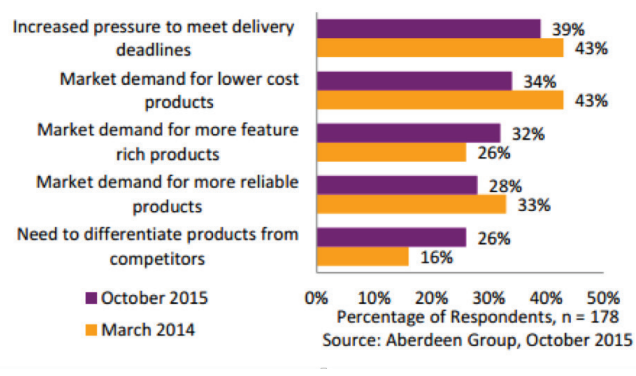


Figure 1: Top Pressures Driving PCB Design Improvements



LIMITATIONS OF CURRENT METHODS: LONG LEAD TIMES AND COSTLY DELAYS

PCB prototypes are critical to the development of almost all electronic products because they permit physical boards to be tested. This can determine conductivity, shape and functionality under actual operation conditions.

For the highly competitive electronics industry, making professional PCB prototypes using traditional manufacturing techniques and outsourcing is a risky business. This is due to the growing demand for more advanced PCBs, including higher layer count and a growing need for smaller and lighter boards, for applications span from IoT to smartphones, medical devices, military equipment and commercial applications.

In addition, there is a very long list of things that must be done right to get from concept to shipping a hardware product, and as technical complexity increases, so do prototyping costs and delays.

Producing a multilayer PCB is a tedious multistage process, including milling, drilling, film transfer and plating machines; copper etching baths; and a press. Additionally, assembly adds additional setup time and complexity. Multilayer counts could bring significant cost increases and delays. This long manufacturing process may be efficient when used to produce large numbers of boards. However, when producing a single prototype board or small volume order, it is very expensive and inefficient to carry out the entire process from start to finish. There may also be a need for proofs of concept, design validations and other interim steps en route to a final full-board prototype.

DRAWBACKS OF OUTSOURCING – DELAYS AND IP RISKS

In the electronics industry, the majority of PCB prototypes continue to be produced by traditional subtractive manufacturing methods, often by overseas vendors - most often located in Asia - that often require several weeks lead time. The original equipment (OE) provider must contract with the prototype manufacturer, wait for the board to be produced, shipped, and clear customs before it is delivered for testing.

Standard turnaround times are generally two weeks, although multilayer PCB prototypes can often be produced in less time for a substantial urgency fee. Costs on a multilayer board are high, and many prototype board manufacturers specify a minimum order quantity of 10, often far above the number of boards that are needed for testing. Adding shipping costs, logistical delays, and duties, the cost of getting one multilayer PCB prototype from an external service provider may equal the cost of 100 units and can take anywhere between a few days to three weeks or more, depending on the location of the supplier. Moreover, when design complexity rises, the time it takes to manufacture the PCB grows exponentially due to higher process complexity, requiring more stages and machinery, and often stretching the lead time into months.

With traditional techniques iterative design and testing become virtually impossible. In the race to develop new product designs quickly, the first PCB design often doesn't work perfectly, which then requires several iterations. When the production of a PCB is outsourced, chances for failure increase because there is not enough time or resources to adequately test more than a few design iterations. This means that even after the PCB prototype has been produced and tested, problems are often discovered and designs need to be updated. The PCB then needs to be refabricated, further increasing the lead time and cost for each product. A tiny mistake in design, or a poor circuit could lead to risky product call backs and other quality problems.

In addition, sending valuable intellectual property to an overseas supplier is a major concern for many companies, especially in the defense industry. To minimize the risk of confidential IP falling into the wrong hands, companies that make products with national security considerations often only work with service providers with the required level of security clearance. In many cases this adds considerably to both the costs and delivery time.

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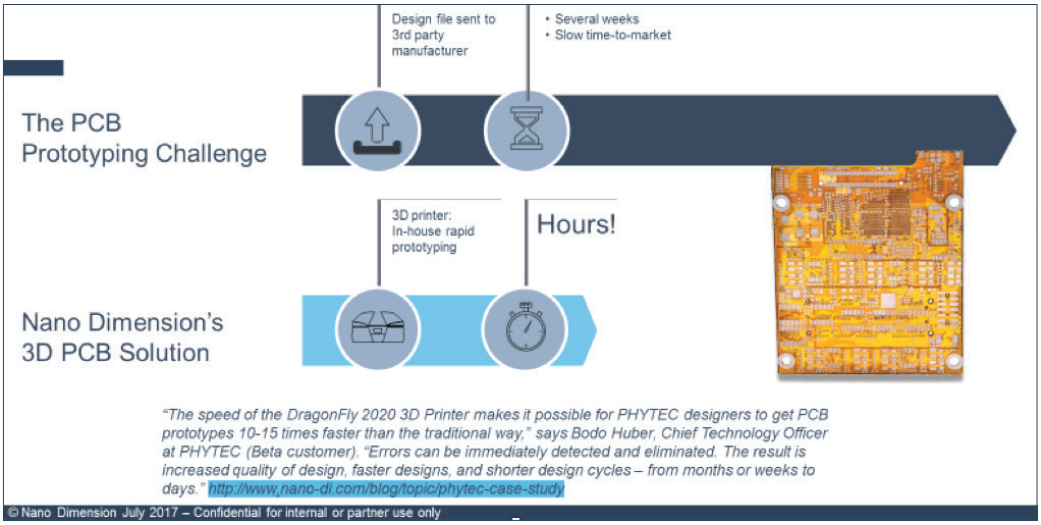
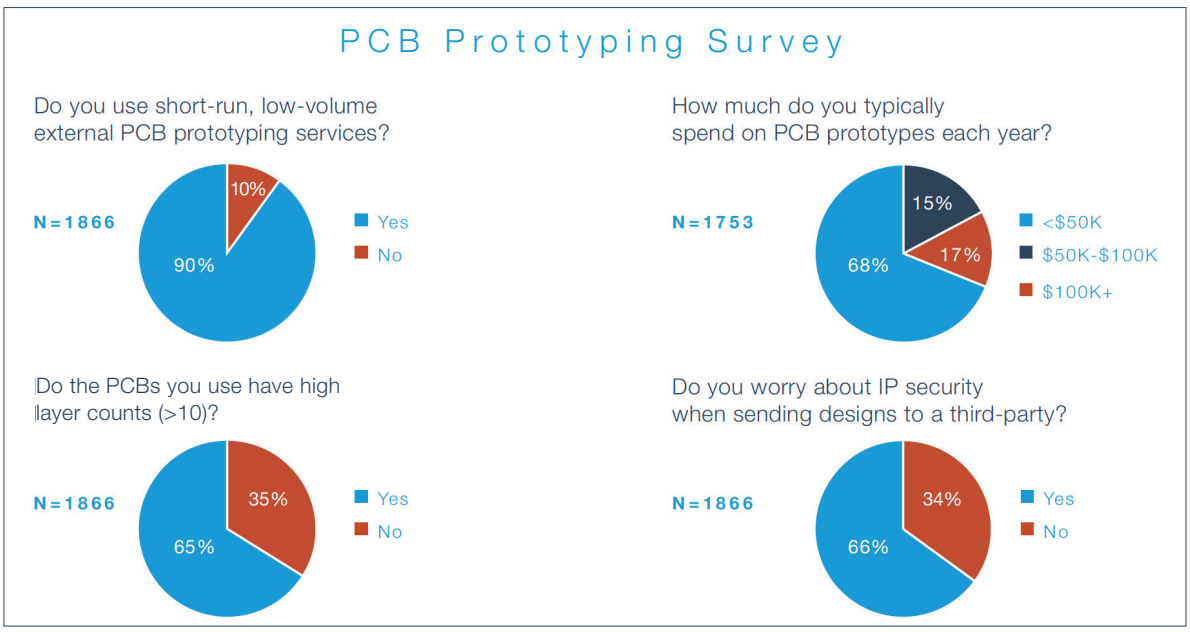
BENEFITS OF MULTILAYER PCBs

- Considerable savings of space
- Reduced overall weight
- Increased functionality and flexibility
- Higher capacity/speed in a smaller footprint
- High assembly density
- Connectors required for multiple PCBs reduced or eliminated



NANO DIMENSION 3D PRINTER READINESS SURVEY

Nano Dimension conducted a "3D Printer Readiness Survey", with responses from PCB designers and manufacturers, electrical engineers, OEMS, and others interested in 3D-printed PCBs and circuits. Results revealed that most companies currently employ external services to create prototypes, and are investing large amounts of money and time into the production of them. The survey also showed an increasing demand for in-house prototyping for research and product development, particularly among companies that spend as much or more than $100,000 each year for prototyping services. This is not surprising since businesses need to quickly respond to changing customer and market demand in this highly competitive industry.



GAINING COMPETITIVE EDGE

3D Printing (also known as additive manufacturing) has earned its position as one of the most exciting technologies to come to market in the last decade. It has revolutionized product design and manufacturing methodology by using additive manufacturing methods to produce prototypes and custom parts in a fraction of the time required by traditional subtractive manufacturing, introducing new levels of efficiency and productivity to support new innovations and generate new revenue.

The technology has been available in various forms for almost 30 years, and is already making a real impact in a wide range of industries. With the ability to produce a prototype or end-use part in a matter of hours, 3D printing is becoming an essential product development technology and is projected to play a significant role in the next industrial revolution.

DragonFly 2020 Pro 3D Printers developed by Nano Dimension bring together extremely precise inkjet deposition printers, high performance silver nano-particle conductive and dielectric inks and dedicated software. The combination of these technologies bring the benefits of 3D printing to electronics professionals. See how below.

BENEFITS OF 3D PRINTING

- Faster time to market by avoiding outsourced manufacturing delays
- Reduced product development cost by enabling teams to work simultaneously on all design projects - maximizing resource utilization and improving overall productivity
- Improved design quality by enabling more iterative design process and so avoid costly changes to design. Low-risk process

IMPROVE TIME TO MARKET

The rapid prototyping capabilities of DragonFly 2020 Pro 3D Printers transforms the traditional outsourcing design and engineering model into a faster, more iterative and more collaborative process. Product development teams no longer have to wait days or weeks for a custom PCB prototype because the DragonFly 2020 Pro 3D Printer offers the capability to 3D print an entire multilayer board, part of it, or just a test fixture at any given time.

IMPROVE DESIGN AND MANUFACTURING PROCESSES

Designers and engineers can work on multiple PCB designs and projects in parallel – testing and iterating on the fly to achieve the best quality design quickly. This improved process, allows them to meet (and beat) scheduled launch dates. The result is improved design innovation, fewer development risks, faster time-to-market, and ultimately better products and competitive design iterations that can be realized for both the current product and subsequent versions.

ENDLESS DESIGN POSSIBILITIES

With the DragonFly 2020 Pro 3D Printer you can print the full range of PCBs, including interconnections, through-holes and complex geometries – without etching, drilling, plating or waste. Moreover, complexity is not an issue. This means that multilayer PCBs, blind vias, and through-holes can be created relatively easily; and there are no drilling or reflow steps to complete.

Beyond PCBs, the DragonFly 2020 Pro can also produce non-planar 3D objects that contain 3D-circuitry. This moves 3D printing beyond traditional electronics formats of multilayer flat circuits into electrically functional structures for a wide range of development, custom and small scale production projects. The application possibilities are endless, including flexible, rigid PCBs and embedded components.