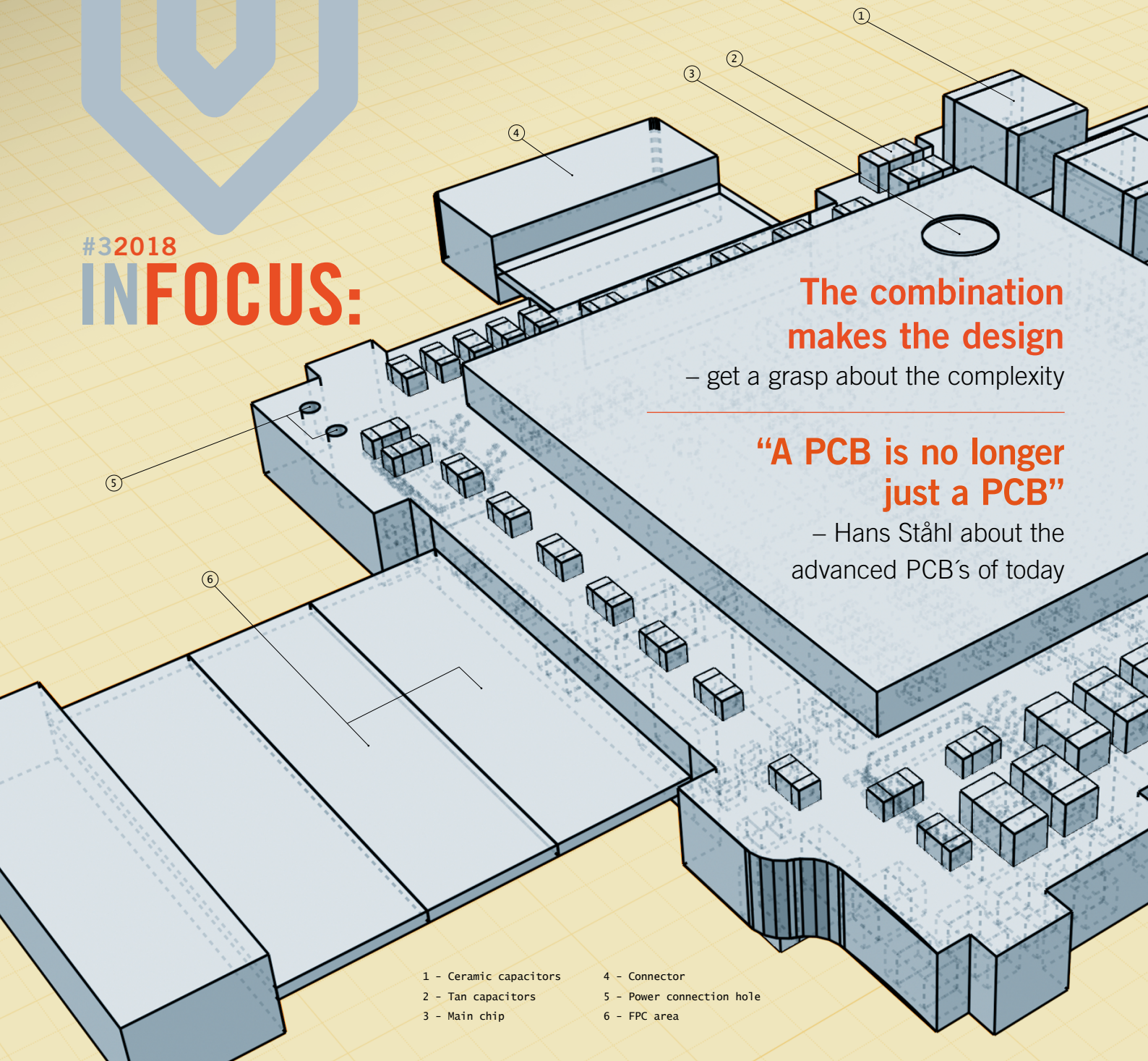


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# INFOCUS:



**The combination makes the design**

– get a grasp about the complexity

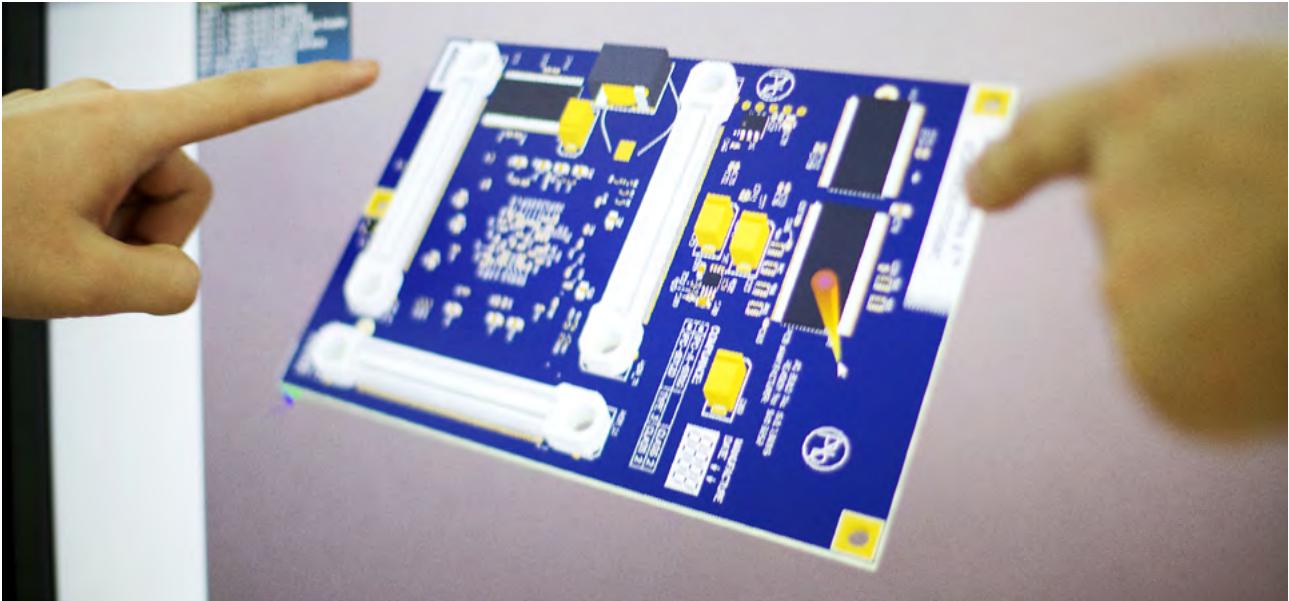
**“A PCB is no longer just a PCB”**

– Hans Ståhl about the advanced PCB's of today

- 1 - Ceramic capacitors
- 2 - Tan capacitors
- 3 - Main chip
- 4 - Connector
- 5 - Power connection hole
- 6 - FPC area

## More advanced boards and shorter product life cycles

– that's how you deal with increased development costs



Developments in the electronic industry are largely determined by the components. The consumer electronics industry has for some time been driving what has become a general trend towards miniaturisation, with an increasing number of features having to be accommodated on a smaller and smaller space. This is now also happening within industrial electronics.

The growth of the electronics industry is making it more important than ever to make a proper job already at the design stage of the PCB production process. To save time and avoid pitfalls, it's advisable to turn to someone with experience and expertise to help create a functioning solution.

The physical appearance of a PCB is largely determined by the components that it is designed to accommodate. Components are shrinking in size and the consumer electronics industry has for some time been driving what has become a general trend towards miniaturisation, with an increasing number of features having to be accommodated on a smaller and smaller space.

This is now also happening within industrial electronics. Consumer products such as smart phones, for example, contain numerous sensors, which are also found in different kinds of industrial applications. Audio-visual or tactile sensors can register things with great degrees of accuracy, thus improving the performance of the electronically steered industrial equipment.

"We are living in an exciting time for electronics. Today, we can see three main trends. All three of them will have a significant impact at the PCB design stage. To start with, the items themselves are becoming physically smaller. Furthermore, the signals they emit use a higher frequency, in other words, they will require greater bandwidths. Finally, power consumption will be high in relation to size, which poses challenges," says Michael Larsson, VP Sales at NCAB Group.

## "We are living in an exciting time for electronics."

MICHAEL LARSSON, VP SALES, NCAB GROUP

### SHORTER PRODUCT LIFE POSES A CHALLENGE

Anyone who manufactures products and solutions for industrial applications, also has to tackle challenges related to shorter component life spans in the market. When designing a product, producers have usually looked to use the same system components for a long period of time. In some cases, they aimed at an end-of-life span of 10-15 years for a product's components. Today you can't as a rule count on attaining such life spans.

"This means that, from a life-cycle perspective, we will continue to



Michael Larsson, VP Sales, NCAB Group

see rising manufacturing costs for a product or component. Investments need to start generating net revenues quicker in order to meet the profit targets. So, from a purely business economics angle, this will bolster incentives to make high quality products, while not spending more time than necessary on the design phase," states Michael Larsson.

### MORE SENSITIVE STRUCTURES AND TOLERANCES

The developments we are talking about will lead to PCB designers having to solve a long line of specific challenges. A great many connecting points need to be crammed into a very small space, through which the integrated circuits of the components run. They will need to find appropriate path to correctly handle the signals in the PCBs. This will be a real test of the PCBs' reliability.

The smaller the boards become and the more functions that will be squeezed into them, the bigger the risk of structure and tolerance related issues arising. What will complicate matters further is the increasing use of sensitive signals. These have to be kept wholly intact as they pass through the PCB, while maintaining a high signal speed. That, as I said, is imperative.

"I am full of admiration for today's PCB designers. Software sup-

port is a great help of course, but despite that, their job is beginning to liken an art form, what with having to ensure high signal speeds while maintaining the integrity of the signals. The future looks bright and exciting, but to successfully tackle the challenges ahead, it is vital to ensure that people with the appropriate knowledge competencies are brought in early in the projects," says Michael Larsson.

**“The smaller the boards become and the more functions that will be squeezed into them, the bigger the risk of structure and tolerance related issues arising.”**

**MICHAEL LARSSON, VP SALES, NCAB GROUP**

PCB technology has come a long way. We are increasingly seeing solutions that were previously considered advanced, such as HDI, rigid-flex boards, multi-level microvias and buried vias. Michael Larsson points out that the real challenges will manifest themselves only when PCB designers find themselves having to take that first plunge into a totally new field of technology, one where they do not have previous experience. “One design team,” he adds, “...might find it a real test to have to start working with components that require microvias, while other teams may have been working with both three-level microvias and buried vias.”

**COMPETENT SUPPORT WHEN TAKING ON MORE ADVANCED TECHNOLOGIES**

No matter what technical level you are working at, you have to be able to handle any issues that arise. So, you should always aim at creating robust designs that produce optimum yields on the production line. Otherwise, the risk is that a substandard design will eventually lead to problems and incur costs further down the line. A worst case scenario might see a producer landed with a design that is totally unusable in mass production, and the company will have to go all the way back to the very first stage to remedy the issue.

“To help avoid such an event, a knowledgeable PCB producer such as NCAB has an important role to play. We are in a place built on the experience and skills accumulated from a large number of customer projects. We are all too aware that many customers face similar challenges and can assist them by sharing our knowledge. Our design

team has most likely already encountered the problem at hand and can provide tips and advice for, among other things, creating a robust design or achieving good impedance control,” says Michael Larsson.

He also points out that the technology involved to create widely different applications can still be similar from a PCB design perspective. The difference between a PCB for a vehicle’s GPS and a control board for an industrial robot is not as big as you might think. NCAB’s design specialists have the breadth of experience and wider picture necessary to help customers with the issues involved when introducing and applying new technology.

“A lot of potential customers would benefit from talking to our technicians. Since we are in a position to choose from several sourcing options, we are not dependent on the capability of any one plant. We are never looking to, so to speak, lock designs that would mean they would only be sourceable from just one manufacturer,” he says.

**THE WHOLE IS THE CHALLENGE**

Michael Larsson makes the point that the toughest challenges rarely occur in the form of individual complications. Rather, it’s about getting all the item’s parts working as whole, preferably at the right cost.

“You can easily find information on how to solve individual issues, such as determining the appropriate dielectric spacings between the line and its reference planes when fitting microvias or working out impedance requirements. The core issue is that, even if the solutions you identify would work as individual entities, the chances are they would be impossible to combine in a working unit.

“Another example is when using extremely fine wire structures, which require thin copper base while at the same time having to meet stringent heat transfer specifications. Those combinations makes things immediately harder. It is important to have the entire picture clear for it not to end up in a dead end like this, which can cost both time and money.”

So, it is vital that designers are fully aware of the pitfalls involved when looking to create a truly robust PCB design, with a combination of different solutions.

“In such cases, those responsible for the design can save time, money and energy by bringing our technicians on board. We have the experience and the overall perspective that is needed,” concludes Michael Larsson.



The difference between a PCB for a vehicle’s GPS and a control board for an industrial robot is not as big as you might think.

## The combination makes the design

To get a grasp of the complexity of combining different parts to achieve a properly functioning whole when designing a PCB for industrial applications, we turned to Ellefen Jiang, PCB Design Manager in China and her colleague Zero Zhang, Quality and Technical Manager, China.

“Design work more often than not calls for the combination of many different technologies - technology for high-speed signals, HDI, rigid-flex, RF signals and so on. It is difficult to separate one technology from the another since the design solutions you opt for in each individual case has to work in combination with the others,” says Ellefen Jiang and continues:

“You need to weigh up functionality against performance and reliability, while the balance between quality and cost is of course always among the parameters. However, NCAB’s philosophy is that the best results are always achieved by having the manufacturing part foremost in mind right from the start of the design stage. The design has to be robust enough to function properly on the production line.

**“You need to weigh up functionality against performance and reliability, while the balance between quality and cost is of course always among the parameters.”**

**ELLEFEN JIANG, PCB DESIGN MANAGER, NCAB GROUP CHINA**

“The industry is developing rapidly. The PCBs are getting smaller and smaller and the signal speeds are increasing. When you pack a greater number of functions into a board, this increases its energy

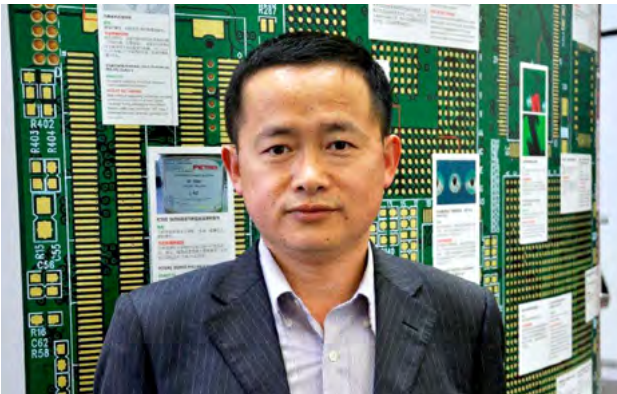


Ellefen Jiang, PCB Design Manager, NCAB Group China.

consumption and leads to greater heat output per surface unit. In a manufacturing context, all this means is, for example, one needs to be extremely careful when selecting the material to be used. Multi-layer high-density designs make greater demands on the quality of material, which in turn affects the structure of the board. It is important to choose the material according to the application. Impedance control is also a crucial factor, while tolerances are reduced,” Zero Zhang says.



Ellefen Jiang, PCB Design Manager in China with two of her colleagues; Glen Chen, PCB Library Engineer and Joshua Zhu, PCB Project Manager.



Zero Zhang, Quality/Technical Manager, NCAB Group China.

**THE TECHNOLOGIES LISTED BELOW ARE AMONG THOSE THAT MAY TODAY NEED TO BE COMBINED ON THE SAME BOARD:**

**High signal speeds**

Fast transfers of large volumes of data are often a priority. This calls for higher signal speeds from the PCB, which means that great care needs to be taken when choosing the material to be used.

**HDI**

Electronics are having to perform a greater number of tasks, while at the same time taking up less space. This has created a need for HDI, which in turn gives rise to many design issues, such as how to handle excess heat.

**“The industry is developing rapidly. The PCBs are getting smaller and smaller and the signal speeds are increasing.”**

**ZERO ZHANG, QUALITY/TECHNICAL MANAGER, NCAB GROUP CHINA**

**Rigid-flex-constructions**

When the size of products decreases, this also leads to purely mechanical challenges in terms of how to fit the board in the product. A solution that is gaining in popularity is the rigid-flex board. This approach, for example, requires care to be taken with regard to the radius at which the board should/can bend and taking measures to ensure that the signal is not affected.

**Many different signals**

With a PCB having to accommodate many different types of components, this will involve several different signals being carried through it. To ensure the signal timing requirements, it is crucial the lines are correctly positioned and the different impedances are within the required levels.

**Optimized power consumption**

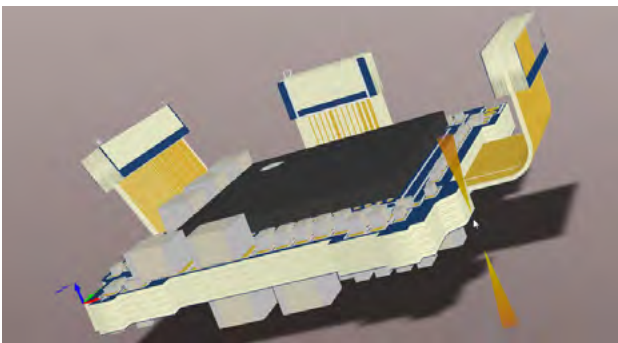
To reduce heat dissipation in the compact units, the internal voltage may be increased to thereby reduce the current level.

**RF-signals**

More and more applications are making use of RF signals. When designing a PCB, this involves, among other things, solving noise and crosstalk issues. Matching the impedances is a crucial factor, as is making sure the received signal is optimized.

[Read more about RF PCBs on our blog. \(In english\)](#)

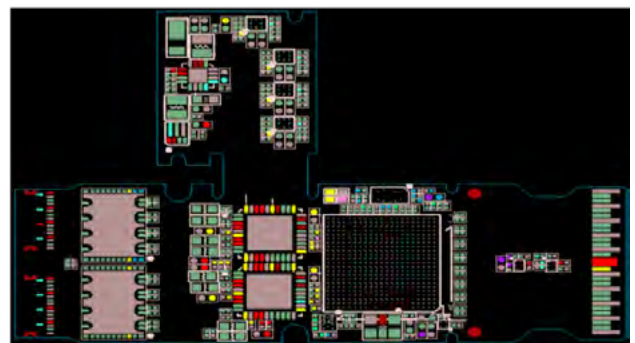
**EXAMPLES OF OVERALL DESIGN SOLUTIONS**



HD for industrial cameras with HDMI and USB3.0 high speed functions within a very small space, (9.8\*6.5CM)

- > HDI and rigid-flex boards with 9 different impedances that need to be controlled (7 in the rigid part and 2 in the flex section).
- > Support for the transfer of HDMI video.
- > Low current 3.3 V designs, with higher voltages for the flex part.
- > Managing crosstalk and timing between HDMI / USB 3.0 / DDR3
- > 3D design to simulate assembly.

**EXAMPLES OF MANUFACTURING CHALLENGES NCAB CAN MEET**



Optical module with high signal speed, density and thermal build up, different thickness of copper, material, types of signals and impedances to control as well as 0.4 mm pitch BGA layout and length-matching the signals.

- > Multi-stage stack 1 + 1 + 1 + 4 + 1 + 1 + 1.
- > HDI and rigid-flex PCBs
- > Ultra-small pads (4x4 mil for wire bonding)
- > Cavity design with depth control.
- > +/- 7% tolerance for impedance control.
- > Back-drill technology.
- > ENEPIG Surface
- > Purchase of non-standard materials.

# A PCB is no longer just a PCB

HANS STÄHL  
CEO NCAB GROUP



We once used to call PCBs component carriers. Today, however, that description is no longer appropriate. Nowadays, the PCB itself carries a lot of built-in functionality, such as heat dissipation, support for different signal speeds, transmission/reception of RF signals, as well as impedance control.

Getting all of these features to function together as a whole, makes the job of designing a PCB a significantly tougher proposition. There are today more “unknown” factors to take into account. To make

sure the board can be put through the manufacturing process as smoothly and efficiently as possible, it is vital the supplier works closely with the designers and CADs.

At NCAB, we work together with many talented designers and CADs to jointly create advanced and efficient PCB designs. We want to continue along that road and further extend our level of collaboration with designers and CADs. This way, I am confident that we will be able to jointly improve thousands of PCB designs.



## NCAB Group in Social Media

To get the latest news from NCAB, follow us on Twitter, LinkedIn and YouTube, and read our blog where we

immerse ourselves in the versatile world of circuit boards!

» [Twitter](#) » [LinkedIn](#) » [Blog](#) » [YouTube](#)

## Join us!

We're always looking for competent people. If you are a well skilled technician, customer service or

sales person, don't hesitate to contact us or send your resume to: [career@ncabgroup.com](mailto:career@ncabgroup.com)

## Subjects we have covered earlier

Do read our earlier newsletters. You will find them all on our website, [www.ncabgroup.com/newsroom/](http://www.ncabgroup.com/newsroom/)

### » A better future

2018 06 18 | NEWSLETTER 2 2018

### » Factory management

2018 04 12 | NEWSLETTER 1 2018

### » More electronics in smaller spaces

2017 12 15 | NEWSLETTER 4 2017

### » Sustainable Business

2017 10 25 | NEWSLETTER 3 2017

### » The PCB Industry in Asia

2017 06 29 | NEWSLETTER 2 2017

### » Engagement and competence development in focus

2017 04 06 | NEWSLETTER 1 2017

## Are we taking up the wrong subjects?

We are always looking for interesting subjects that we could take a more in depth look at.

If there is something you would like to learn more about, or perhaps you would like to comment on anything we have written, do get in touch with us and tell us more.

Mail: [sanna.magnusson@ncabgroup.com](mailto:sanna.magnusson@ncabgroup.com)