

As part of the process of creating the Cover Story for the 28 July 2015 issue of *New Electronics*, number of people from the UK electronics industry were asked to provide their views to the following questions. Their full responses can be seen below.

Providing feedback were:



Steve Applegate, engineering director, Stadium Power, and chair of Stadium Group Technology Board



Ken Ball, electronic supply chain and manufacturing programme manager, techUK



Derek Boyd, chief executive, NMI



Andrew Holland, founder and managing director of RF Module & Optical Design



Tony King-Smith, executive vp of marketing, Imagination Technologies



Stephen Pattison, vp public affairs, ARM



Left: Antony Rix, principal wireless consultant, TTP

Right: Nigel Toon, chief executive officer, XMOS



**How do you see the UK electronics industry's relations with Government now and in 2025? How important do you think Government support is for the electronics industry. What particular initiatives would you welcome now and in the future? Are you or your organisation involved in any of these initiatives? Which initiatives do you see as having most impact? How important is it for small companies to get involved in Government procurement?**

**Stephen Pattison:** Unlike some other major sectors, UK Electronics has been slow to develop relations with Government. But that changed two years ago, with the formation of the Electronic Systems Council in recognition of the contribution the sector makes to the UK economy. At the time, it was estimated that some 850,000 people worked in 'electronic systems' in the UK. Emerging research suggests that is already closer to 1million and that there has been a considerable interest in the number of SMEs in this sector in the recent past. Looking forward, we need to think carefully about what we want the Government to do for the sector. The starting point should be: *'if it ain't broke don't fix it!'* And this is a view strongly shared by the Government. STEM and apprenticeships is one area where we can collaborate with Government (and have already done so). Another is to encourage public sector investment in research and in funding significant pilot programmes to test and showcase key new technologies. We were delighted by the Chancellor's announcement in his March Budget of £40m funding for projects linked to the IoT, including one looking at IoT uses in the NHS. This has a chance to kickstart a transformation in the way health care is delivered. Other projects will do the same for transforming our cities into smart cities, i.e ones which use resources more efficiently to deliver a better quality of life for their citizens. Above all, we need the Government to commit to making the UK a world leader in this area. The PM gave a speech in 2014 on his vision for the IoT and how the UK could lead a second industrial revolution. We need government and industry to work together to make this a reality. SMEs have a huge part to play in this. Whether as component manufacturer, or device designers, or whatever, they are a vibrant part of the UK Electronic Systems ecosystem. Supporting SMEs is emerging as a priority for this Government, and rightly so.

**Steve Applegate:** The Government and the electronics industry in the UK today are disconnected. The UK electronics industry has not seen key investment nor government support for decades, and is now struggling to compete with global markets and lower cost offshore alternatives. Government support is extremely important if the electronics industry is to survive in the UK. Specific initiatives could be tax allowance or grants to reduce the cost of R&D in order to offload the total engineering overhead that is often a barrier to innovation. Subsidies to educate and develop engineering skills

would also be beneficial to UK businesses to help fund R&D talent development. Other more generic business tax credits on fuel and energy costs would also help to reduce the overall costs of service and manufacturing in the UK which would in turn help to reduce the competitive gap versus offshore alternatives.

It is also extremely important for UK businesses to be aligned to Government procurement policy, to feed the UK economic infrastructure. Many other countries actively procure inwards as a matter of policy. The UK should also adopt this policy to help local businesses grow and benefit from opportunities across the supply chain in this country.

**Andrew Holland:** The Government's role should be to concentrate on the education of world-class STEM graduates. They can also facilitate innovation by establishing frameworks and offering more speculative early-stage funding for inventors and entrepreneurs. Get this right and business and technical collaboration will happen. A soft-touch from government is always preferred. R&D tax relief and a quest to remove layers of red-tape will always be welcome.

**Derek Boyd:** Until the recent election, I would say that the industry's representation and connection to Government were as good as they have ever been; the ESCO report was published and well-received and the ESCO Council was established. Baroness Neville-Rolfe, Minister of State for IP, was a great supporter and, as co-Chair with Warren East, did some sterling work. There were some significant breakthroughs: there was additional funding for IoT; approval for a Graduate Trailblazer apprenticeship; and we got to the final stages of the Autumn Statement with a bid through InnovateUK to increase investment in ECSEL by an order of magnitude from where it sits today. NMI was connected with all of these activities,

We currently see that industry associations are working together better than ever before to develop coherent and concerted messages; it's critical for us to maintain that.

ECSEL investment would have been very significant and we still need to do more in that area. The Graduate Apprenticeship model with the funding support that's available could be vitally important to the future of our industry and the way our companies attract and develop young engineering talent.

**Ken Ball:** techUK works closely with government, on behalf of industry, to secure a supportive regulatory environment for the electronics and wider technology industry.

The Department for Business Innovation and Skills (BIS) recently published techUK's report on export controls process for UK based electronic component and systems manufacturers. In response, the Export Controls Organisation (ECO) has committed to implementing change to improve the export controls environment.

**Nigel Toon:** Governments move at a very different pace from the speed required in a small or medium sized company. With technology, it is hard for governments to keep up and to track the emerging trends. The role of government should, therefore, be to create an attractive environment for entrepreneurship and for innovation. Support for entrepreneurs can be achieved through tax structures and incentives for small companies. Loan support schemes and ensuring a market exists for risk capital is also important. Small and medium sized companies also benefit from flexible labour laws. Technology companies need to operate in a global market and support needs to be given for exports and international sales expansion.

UK government schemes for enterprise investment and management incentive schemes are extremely positive. The R&D tax credits and patent box schemes support and encourage innovation and UKTI have active schemes to encourage international expansion and provide support at trade shows around the world.

More could be done to support growth capital but, on balance, the UK is an extremely supportive environment for technology start-ups and is a great place to build a technology businesses.

Beyond this level of structural support, it becomes much harder to create schemes that can really support small and medium sized technology businesses and we run the risk of doing more harm than good. Supporting Universities and encouraging them to engage with small businesses to share research and facilities is one route that can work. More could be done in this area to create centers for innovation in key areas that encourage technology clusters to emerge.

**Antony Rix:** We've seen a number of government initiatives that have improved relations; for example, the SBRI programme, TSB/Innovate UK, UKTI and technology catapults.

We have found those programmes procuring innovation, rather than part-funding research, to be especially valuable. R&D tax credits have greatly helped research-intensive UK companies and should be at least maintained.

At the same time, it remains very difficult for SMEs and even larger enterprises to engage with government procurement. There are many innovative companies in the electronics industry that are just too large to meet the SME definition (less than 250 employees), but that do not have the scale of global R&D giants. Funding rules and competition frameworks that require intensive co-investment and impose difficult limits on expenditure often favour much larger, multi-national companies, and this is a continuing barrier to growth.

**King-Smith:** ESCO enabled us to bring together and quantify the scope of the UK industry. It created a voice that government wanted to listen to. The result is a stronger industry than before and, crucially, the NMI, which was instrumental in bringing ESCO together, is also now much stronger as a result. For example the NMI's recently Bletchley Park security event

brought together a truly impressive community of expertise in an area where UK companies are very strong.

Why did we need ESCO? Well, electronics hasn't been recognised in government policy as such, so it is our job to make people realise it impacts energy, health, transport etc. Indeed electronics impacts all key areas of government policy. Despite the ongoing success of ESCO we still have some way to go in getting the status we deserve in policy. We see it is essential for us, and others, to continue to push government for coherent electronics policy that fosters growth and innovation and so we increasingly talk direct to government, as well as via NMI, ESCO etc.

**How do you assess the UK's ability to innovate and to exploit that innovation? Graphene and plastic electronics are two areas where much was expected, but momentum appears to have been lost; what needs to happen to better exploit the UK's basic technology research? Do you think this will improve over the next decade?**

**Pattison:** The Catapults and Knowledge Transfer Networks are focusing hard on this issue. Some universities have dedicated officials looking at how to take university research into the commercial world. And the picture is not all bleak: in many areas, there is a healthy interaction between universities and business. The Government wholly supports this, and we expect more of it in the future.

But getting universities closer to business is not the only answer. We need a pool of informed and interested investors, whether angels or, more importantly those willing to invest at later stage of development to lead the company towards large scale production.

Capital is obviously global, and UK companies can attract US funding. But – and this links to the point made earlier – we need the UK to be seen as the 'go to' destination for electronic systems innovation - maybe not in every area, but in key areas like cybersecurity, energy efficiency and so on.

**Applegate:** The UK's ability to innovate has declined in recent years, mainly due to a severe skills gap as academia tailored university degrees to suit the demands of a growing service industry. In addition, the cost of developing and taking innovative products to market is high, so the need for technology research, development support and funding is critical.

There are many examples of where innovators have moved offshore to seek financial backing simply because they could not achieve sufficient funding in the UK. It is well known the true success rate of new innovations and products is low and this is a real concern of risk for financial institutions. To improve the support of technology research over the next 10 years, the financial burden needs to be shared or subsidised through Government initiatives and incentives.

**Boyd:** Is it loss of momentum or over-hype? A decade ago, plastic electronics was allegedly going to replace silicon; utter nonsense to

anyone with a basic understanding. The time expectations are also unrealistic; from lab concept to product can take a decade or more and that's one of the challenges our industry faces in the investment cycle compared to, for example, apps development. Investment in this journey is fundamental and we're in a period where this is difficult to obtain; that's an area we hope to see change over the next decade and a supportive tax climate around investment will be important. The push on universities to seek impact from research is increasing and EPSRC should be congratulated on taking positive steps; that's something we can work with.

**Ball:** The UK has huge potential to innovate and exploit innovation. To make this a reality, it's vital that small and micro-businesses – often the most innovative – have equal opportunity to compete for government funding.

New developments, such as the IoT and smart cities, will drive the electronics industry. The £40m funding for IoT technologies announced in the March budget demonstrates there is a clear government appetite for innovation.

Plastic (Printed) Electronics will continue to grow and driven by the need for flexible/wearable electronics, but using a mix of conventional and printed – not wholly plastic. True organic semiconductors are some way off and will probably only be developed for very low cost consumer items such as tags.

Graphene, as it applies to electronics, has so far shown little direct application. However, what it has led to is the research and application of 2D materials. These other materials which exhibit useful properties in one-atom layers may well be incorporated into new semiconductor devices.

**Toon:** The UK has world-class engineers, scientists and innovators and an environment that supports entrepreneurs. Start-ups and university spinouts have access to seed funding and start-up capital. Perhaps what we lack are management teams that can grow businesses and which have the ambition and track record of building large successful international technology businesses.

Some successful businesses stand out, but we need to achieve this on a broader scale. Access to growth capital is key and developing a public investor market that rewards growth, rather than earnings, is also important. If we compare ourselves to Silicon Valley, our track record looks poor – however, this could also be said about other tech regions in the US or around the world.

Perhaps a better example is to look at China and understand the growth capital that has been made available to support some of the growth of big businesses there who have turned into major world leaders in communications and computing.

**Rix:** At early stages of research, we could do better with translating research. Nevertheless, in the last 10 years, UK universities have become

more flexible. The spin out by Atlas Genetics of novel technology developed at the University of Bath, supported by TTP, is a great example. Areas that could be improved include better take-up of already available research council funding and more creative engagement between academia and industry.

A serious issue is that many large UK corporations and global companies headquartered in the UK have cut their R&D budgets substantially. This is a reflection of wider changes: these companies increasingly expect their suppliers to innovate and buy in a global market. Without this basic investment – whether internally or with close partners – corporations will struggle to grow and will find themselves exposed to global competition. Disruptive global players like Google are clearly taking steps to invest some of their profits in both research and diversification. Just as Apple displaced Nokia in smartphones, these corporations will do the same in other markets.

**One of the themes of the recently published ESCO report was the need to collaborate across industry sectors. What is holding back the development of this collaboration? Do you foresee better use of the UK's supply chains in the coming years? Does Government have a role to play in encouraging the use of UK developed technology?**

**Pattison:** ESCO needs to reach out and find a way to work more productively with other sectors. We need to overcome the inherent conservatism of some sectors, which have their traditional supply chains and habits of doing business. This, of course, happens in individual cases: ARM is talking much more to automotive companies than it used to. But it needs to be on a wider scale – particularly if SMEs are to get their voice heard. The Digital Revolution will push all traditional industrial sectors to reach out to new players to maximise the benefits of embracing the new technology.

**Applegate:** Many offshore companies have invested in their engineering and manufacturing facilities for years and, as a result, have achieved high quality manufacturing excellence at a competitive price. We all enjoy affordable technology that is designed and manufactured offshore and is fundamental to our businesses and living in a digital age. Until the UK can develop and provide its own 'must have' products and technologies – often driven by multi industry collaboration and sharing knowledge – it is difficult to see how Government intervention can have any real effect.

**Holland:** The excellent ESCO report showed how the UK Electronic Systems industry can lead product offerings in the burgeoning IoT space. As a Cambridge start-up, we need to collaborate with companies aligned either side of our product offering. The good news is that the UK is equipped across all sectors to bring such a compelling product to bear.

**Boyd:** Electronic systems are already a critical part of almost every industrial sector; cars, for example, are moving to massive electronic hardware and software content. A paradigm within JLR is to consider the car as a distributed mobile computer platform that's programmed as a car! So industry associations have a great opportunity to build on this trend and to develop value provision for members in industry sectors. For example, NMI has established the Automotive Electronic Systems Innovation Network; increased our membership in aerospace and defence sectors; and are finding great merit in chip-to-system collaboration. UK Supply chains are tricky; we're part of a global ecosystem and failure to recognise that would be wrong. Through investing in R&D through the research councils and InnovateUK, I believe Government is taking a good approach; you can ultimately encourage use by encouraging development that leads or keeps pace with world-leading efforts.

**Toon:** Local initiatives do exist. Bristol has a number of technology interest groups and industry networks that encourage cross industry discussion and cooperation – the work centred on robotics is a good example. Building technology clusters is very important, but for these to succeed you need strong local champions that can lead these efforts. Supporting companies to grow and become major international successes would have a huge knock on effect in the local areas for smaller spinouts and start-up companies. Cambridge is a great example of this and outside of London, Bristol and Manchester are both making good progress but ultimately success will breed success.

**Rix:** UK Government could do more in its procurement to build a more diverse and resilient supply chain in the UK in both electronics and ICT. Available tools should be used routinely to recognise the value of local research and manufacturing. Global competitor countries like the US, France and Germany do this as a matter of course. At TTP, we see reshoring of design and production. The UK manufacturer base has responded to globalisation and competes particularly well on time to market, high quality and high value manufacturing. This sector is critical to UK exports, so needs to be supported wherever possible. UK design specialists like ARM, TTP and other 'Cambridge Phenomenons' companies are currently thriving and winning contracts against global competition, and help foster diversity and a local skills and knowledge base.

**King-Smith:** We do think that things like the Digital Catapult and Manufacturing Catapult are examples of helping bring together skills in the UK around focus centres but much more needs to be done to make them relevant to us and others in the electronics industry. We need to work with funding groups such as EPSRC and Innovate to ensure the balance of funding between applied research and the nurture of startups is right.



**While there has been broad discussion of the lack of 'new blood' entering the engineering sector, another issue which has had less coverage is the ability of those managing UK electronics companies. Do you believe that UK electronics companies, in general, are not led as well as their global competitors? UK companies have also been seen as less successful when it comes to accessing global markets. What might help them change this and do you see UK electronics having more export success by 2025?**

**Pattison:** ARM disproves your assumption: it has a great record of leadership and global expansion. It shows what can be done, but there is a lingering tendency for some companies to sell out early, rather than invest in long term growth. This may be a cultural thing. Furthermore, success needs more than engineering skill: it needs entrepreneurial flair. ARM's early decisions to highlight energy efficiency and to decide not to manufacture chips were two such decisions which played a crucial role in the determining the direction of the company.

**Holland:** Skills in business management are changing as fast as the need to design new business models in the IoT space. RFMOD has ambitious plans to generate revenues of both sides of its business, Semiconductor Packaging IP licensing and through the BeanIoT™, IoT hardware-App plus Insights-as-a-Service.

**Boyd:** I see fantastic leaders in this industry. For the UK to produce two of the world's leading semiconductor IP companies in ARM and Imagination is amazing and, of course, that's down to great leadership. With luck, people like Mike Legoff at Plessey and Nigel Toon at XMOS will be next and there are younger companies, such as Blu Wireless, Ultrahaptics, GSS and Surecore doing incredibly well. Most UK companies are 'born global' and leaders realise that. It's not easy though! Government helps through public investment and by 'talking up' opportunities like IoT; we need to keep such political support going. UKTI has a major role to play and its direction on establishing Trade Challenge Partners should make it easier for organisations like NMI to help their members export more.

**Ball:** There is no underlying reason why UK based businesses cannot be global leaders. To support small, innovative companies grow and scale, we must take a holistic approach that includes platform catalysts and skills development and encourages hunger and desire of UK entrepreneurs. We have called on the government to implement the recommendations in Sherry Coutu's Scale Up Report to ensure the UK remains a leading economy and a leading innovator.

**Toon:** This is a fundamental issue, compounded by a lack of growth capital that can support expanding businesses. Capital markets are a problem with UK public investors more focused on earnings than on

growth. There is a lack of depth in analyst coverage focused on complex technology businesses that can provide the investors with accurate investment information. New management teams need to build their skills in high growth successful technology businesses before they jump out and start on their one.

We need more international successes to stimulate this virtuous circle. Silicon Valley works because successful entrepreneurs either start new businesses or go into VC and support new companies. Middle management from these successful companies gain skills and experience that allows them to lead the next wave of start-ups. Their old bosses will act as mentors, seed investors or will be sitting in major VCs providing the capital for these new companies. Successful businesses grow because they have support in international markets – so working in a successful businesses helps individuals to build a network of contacts and connections in sales channels, and at international customers.

**Rix:** It is striking that, in the last two decades, the Mittelstand companies in Germany have thrived. These organisations expect to invest for the long term, helped by stable investment and taxation regimes, by benevolent (often family) owners and by a focus on global markets. UK companies can learn from this.

**Do you see, in a decade's time, a new generation taking companies forward? Will the industry be typified by a broad range of start ups and agile small companies, for example? Is there any prospect of the UK building a global consumer brand and, if not, does this matter?**

**Pattison:** We can see a new generation emerging already. The digital revolution is enabling small start-ups to go from zero to hero in even less time than it took ARM.

Agility is a different issue: every cumbersome conglomerate was once a start up! The trick is how do you maintain the impetus behind innovation and creativity in mature companies?

There is no magic formula. Probably the most important element is culture: how can a company which is already successful, create and maintain an culture which encourages challenges and innovation. And then, talent. It is good people who make good companies.

**Applegate:** Within the next 10 years, it will be important for the UK to establish itself as an innovation centre of excellence that attracts worldwide interest. This may come from a broad range of startups, but financial support from institutions and Government is required to support research and product development at source and to assist with taking products to market and attracting the interest of global players. Establishing a global consumer brand in the UK would indeed empower

the owners of that brand with the choice of local procurement to boost the local economy.

However, becoming a global brand is a longer term process that requires a high level of investment, with a high level of inertia, and would be difficult to scale or provide the effect needed to be successful in a very competitive and progressive industry.

Although this may help, a more practical solution would be to reinvent the UK as a bespoke solution provider that has ownership through must have IP into established brands. Design centres would collaborate with local 'engineering centred' electronic manufacturing service providers and OEMs who will help to take new ideas to market.

**Holland:** Scale matters in manufacturing; just look at the gigafabs in Taiwan. But the UK has a great track record of pure innovation with small teams making a global impact over a short-period of time. A UK global consumer brand? Yes, we can!

**Boyd:** It's clear there's a lot of consolidation going on; the cost of developing a leading edge chip is almost beyond the reach of small companies. Higher costs require higher volumes and that's driving the consolidation we're currently witnessing. NMI believes there will be opportunities for a new breed of small companies focused on and excellent in their target niche. Good examples are Sondrel, in design support, and Vertizan, recognising the need to take a different approach to software testing.

It's not impossible for global consumer brands to emerge from the UK; arguably, PURE is already there, although clearly not on the scale of Apple or Samsung and don't forget Dyson. Having such a flagship in the UK would provide a great boost. However, this is a global industry and the amount of UK developed technology inside some leading consumer brands would suggest the need for these brands to be located here is not a show-stopper for those that want to be part of the supply chain.

**Toon:** The growth may come in electronics or it may come in software or technology services. It is hard for small companies to displace large established companies unless there is a massive technology shift or disruptive change. Small companies need to focus on nascent and emerging markets, where they can deliver a big advantage. Being 30% or even 100% better is not enough; x3 or x10 needs to be the goal.

These new companies might focus on consumer or business to business – the sector is less important than the market characteristics – considering aspects of technical fit and disruptive advantage, market potential and market timing are much more important.

**Rix:** The UK is clearly continuing to innovate, with many new technologies emerging, and novel products and services being developed. Close-to-market innovation is, however, increasingly becoming the domain of the start-up – examples of UK leaders in new market sectors include Green Energy Options and Displaydata.

The fragmentation of the major markets in Europe puts companies at a disadvantage compared to the US. This isn't just a UK issue, it affects France and Germany also, but it's easy to overstate the importance of this: a genuinely innovative product or service, managed and marketed confidently, can be translated to a global brand, with Dyson being a great UK example. Many UK electronics companies, like TTP, have always operated globally and are fostering a new generation of engineers and entrepreneurs. The UK market is large enough for a product to be launched and a good return on investment achieved as a stepping stone to global markets.

**King-Smith:** We are extremely interested in getting new blood into the industry and work closely with universities to make sure that not only are people educated in line with real industry requirements but that they are interesting people pursuing novel ideas (I've personally been providing input to several PhDs). We have numerous activities to promote STEM in schools and beyond that to really enable universities to excel. Our latest program, MIPSfpga, lets universities study MIPS RTL code and explore a real MIPS CPU.

**What other issues do you think are affecting the UK's electronics industry today and what solutions might be available to those problems?**

**Pattison:** A lot of people would say there is an image problem. It affects young people's enthusiasm for electronics. Graduates in computer science are often tempted to go into the City, so we need to show the tech sector can offer exciting and rewarding careers to people from all backgrounds.

**Holland:** I am very fortunate. I started my career at GEC Marconi in 1990: a great training ground, because you could walk from the design centre to the fab to the assembly and test floor. Today, a consumer products designer needs to know the limitations and capabilities of processes and equipment which, perhaps, sit thousands of miles away. IMAPS-UK and NMI and KTM can help UK designers connect with the intimate DfM skills needed.

**Boyd:** Skills is the perennial challenge and, as an industry, we really need to get our act together to do more to influence and attract future talent. The partner companies that helped start UKESF have recently reinvested to support a bigger impact going forward. Our other big challenge is developing industry cohesion; ESCO figures suggest we are a big industry in the UK and we know more and more products will become smart and connected; the permeation of electronic systems will increase massively. We sometimes fail to act as a coherent community in comparison to vertical sectors as aerospace and automotive. Getting our own act together is a precursor to getting Government support.

NMI is developing its strategy to bring cohesion around significant challenges and opportunities; for example, automotive and IoT (where we are focusing on Security) and supporting the core capabilities that cut across all market segments in areas such as emerging materials, power electronics, digital and RF design, embedded systems and software.

**Ball:** A significant issue affecting the electronics and wider tech industry is the skills gap. There is a chronic shortage of skilled electronics engineers, especially analogue design. If this shortage is not addressed soon, then the UK electronics industry faces a bleak and uncertain future. The Government's ambition to increase the number of apprenticeships is to be applauded, but Government must work closely with industry on implementation to ensure young people are trained for the jobs of the future.

**Toon:** The UK has only a small local market and this means companies often need to look to international markets to drive growth and expansion. US or Chinese companies, by comparison, can find big customers in their 'own backyard'. This can be a disadvantage and an advantage. Having an international focus will make companies more open and flexible, but adds a layer of complexity and cost that needs to be managed.

**Has the acquisition of UK electronics companies by multinationals had a negative affect on the sector? Is this a trend you expect to see continue?**

**Pattison:** In a global economy, cross border acquisitions are inevitable. ARM has benefitted from them! We don't need to regret it. As long as we have a wide pool of new companies and a significant number committed to the long term, the sector will flourish.

**Applegate:** Unfortunately, many UK technology product companies have been acquired, closed and transferred to offshore sites over the past decade. This has definitely had a negative effect on UK suppliers, with increased costs of service and supply, and limited contact with new decision makers. Once a company is acquired and moved offshore, it will often look to local sources for new product developments. There need to be viable business reasons for overseas companies to continue to engage with UK businesses, for example technology access, innovation and R&D.

**Boyd:** It's mixed. The good news is that it represents significant investment into the UK and important job security. The downside is that the control over strategy and investment is no longer made locally. Fewer opportunities for leading industry executives to work in the UK is a concern. I think there are more significant acquisitions to come too.

**Toon:** In Silicon Valley, most start-ups end up merging with larger companies. Only a very small percentage grows and goes public. Even in the public markets, we are seeing more consolidations and mergers. This

is a natural part of the business cycle and varies based on the cost and access to capital and the relative strength and investor sentiment around business models.

Mergers and acquisitions create opportunities for middle management to consider new roles and start up opportunities, where they can use recently learnt skills to drive new businesses. Engineers might be encouraged to join new companies, where their innovation and skill will be recognised and their contribution is more visible, rather than becoming lost inside big companies. The UK needs an appropriate mix of successes that lead to large sustainable public market funded technology businesses plus a buoyant mergers and acquisition environment. This will encourage new risk capital as these investors see exit opportunities that can create a strong return from their investments, either through M&A or public market exits.

### **Finally, could you let me know what you think the UK electronics industry will look like in 2025?**

**Pattison:** Ten years is a very long time in this sector, but my hope is that the UK will be leading the way in some smart technologies, with a much bigger ecosystem of electronics companies in support!

**Applegate:** With the right government support, inward investment and commitment from the industry to develop technical capability at home, the UK electronics industry has the potential to be great. However, we won't get there overnight, so we need to stop talking and start collaborating.

**Holland:** I think the UK can lead new IoT product, software and business models – we're a nation of innovators and are nimble enough to move quickly onto the next big thing.

**Boyd:** UK industry is well positioned to take advantage of the permeation of electronic systems that will increase over the next decade.

**Toon:** The big change over the next 5 to 10 years will be centred around machine learning. This will create a massive shift, major new companies and will disrupt current market leaders. It will drive software, hardware and semiconductor technology innovations. It will affect datacentres, mobile devices and embedded products in both consumer and industrial markets. In the same way that the Internet and the smartphone have affected whole industries, machine learning will create new disruptions and will create new businesses and new services.

If we look back 15 or 20 years, there have been some massive changes. I expect the same level of change looking forward over the next 15 to 20 years. By 2025, some of the most valuable companies listed on the London, New York or Shanghai stock markets will be ones we have never

heard of – if just one of these new mega businesses can emerge from the UK, that will be a great outcome.

**Rix:** There will continue to be a diverse ecosystem of start-ups, design specialists, contract manufacturers and global companies with R&D and manufacturing in the UK. The decline of some global brands with significant presence in the UK will hit us and a significant risk is that emerging technology ‘unicorns’, including well known US companies and some emerging from China, will have no base here and will erode some of our major export markets.

**King-Smith:** By 2025, if we bring together the electronics community to focus in key areas such as health, energy, industrial and agriculture, then we can have a strong UK electronics industry that punches above its weight on the world stage. But this is not just about UK initiatives – we need to show global leadership. The UK has capabilities in many disciplines, from leading IP to advanced automotive and aerospace industries, but we must harness that to make the UK a much stronger force in the global economy.