

ADDRESSING THE SKILLS GAP

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The engineering skills gap was first highlighted a decade ago and has been the topic of much debate ever since. Whilst it's now widely recognised as an issue of global proportions, current indicators suggest that efforts to redress the problem have fallen way short of the required success. Even the most recent reports continue to paint a gloomy picture, predicting that by 2020 the global gap between supply and incremental demand for qualified engineers will be as high as 74%¹. To date, remedial efforts by the government, educators and industry have been largely focused on the supply side of the problem – i.e. “make more engineers”. However the evidence shows that this strategy alone will not resolve the problem and a different approach is required. What is needed is a different perspective on how to bridge the gap and prevent what has been described as a “car crash in slow motion”².

This paper discusses the global trends driving the skills shortage, examines what has been done to date to redress the problem and offers insights into how the manufacturing sector can help itself in the here and now by looking at the situation through the lens of consumption, rather than just supply.

¹ NASSCOM Perspective 2020; McKinsey analysis

² John Cridland, Director General, CBI, October 2014

IS THERE A PROBLEM AND IF SO, WHAT'S CAUSING IT?

No matter the specific industry sector, manufacturers worldwide are under increasing pressure to reduce time to market whilst improving product quality and performance, driving a need for product innovation.

The reasons for this are well-documented and myriad, with global, overlapping trends compounding the problem. The global population explosion, increasing maturation rates of emerging markets, the speed of technological innovation on a scale never before seen and the unprecedented rate at which new products are adopted - all of these factors ultimately mean one thing. The global population is demanding and consuming more products than ever before in the history of our planet. This in turn is pushing manufacturing industries to cut product development cycles to meet that demand, stay ahead of the competition and survive.

Other trends are only exacerbating the situation. Demand for more heavily customised and personalised products is adversely affecting suppliers' ability to create, innovate and execute at scale, squeezing design and engineering resources and pushing engineering and production capacity to the limit – or beyond.

Skills deficits and an ageing working population are not unique to the engineering field, but the sector has been particularly badly hit. The impact is already being felt by manufacturers throughout the supply chain who are struggling to recruit and retain the necessary expertise but whose survival depends on their capacity to innovate – to design and engineer the products of the future, on a scale never before seen.

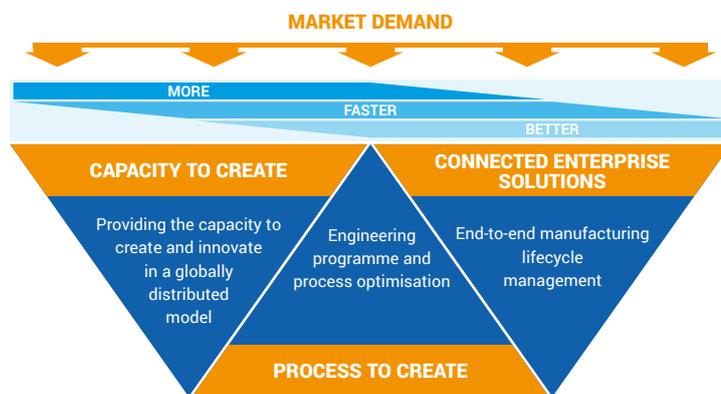


fig. 1

The world is changing; a period of unprecedented global population growth, with rapidly maturing emerging markets. Technology is evolving faster than at any period in history and technology adoption rates are accelerating. Product development cycles are being compressed, globalisation is the new norm and consumer trends are driving increasing levels of personalisation and customisation.

WHAT IS THE SCALE OF THE PROBLEM? IS IT THE SAME EVERYWHERE?

Despite accusations from some quarters of scaremongering and exaggeration regarding the engineering skills shortage, there is a wealth of credible information to the contrary from government and industry bodies. Much of this is readily available in the public domain and perhaps one of the most well-known is the Perkins report, a special review of engineering skills commissioned by the UK Department for Business Innovation and Skills and published in

November 2013. The review, conducted by Professor John Perkins, concluded:

“There is enough evidence to support a need to substantially increase the supply of Engineers, at both professional and technician level in the UK, and there is no room for complacency.”

– Professor John Perkins

Organisations such as McKinsey & Company, The Royal Academy of Engineering and the Federal Aviation Administration have also independently conducted extensive research into the scale of the engineering skills gap. Their findings all conclude that the gap exists, is significant and is set to grow still further, with demand for engineering talent predicted to far outstrip supply within a decade. In the U.K. alone, it is estimated that an additional 1 million engineers will be required to meet the demand whilst globally the gap between supply and demand has been put at 74% by 2020.

Further research³ has revealed that the talent supply gap will be felt most acutely in the industrialised and mature regions of the world. North America, Northern and Western Europe, Russia, Japan and Australia are predicted to bear the brunt of the deficit by 2021. By contrast however, regions such as India, the Middle East and South America show a predicted surplus of talent, suggesting that a geographical redistribution of engineering design and execution may be on the cards to meet the needs of the global economy.

Whilst this research is looking ahead into the future – albeit not distant – the impact of the shortfall is already being felt in the here and now. Many manufacturers are reporting difficulties in recruiting people with the necessary qualifications and skills. In recent studies⁴ in the UK, 40 percent of manufacturers reported that they were struggling to recruit whilst manufacturing and engineering vacancies have risen by 40 percent over two years from June 2012 to June 2014.

DISPROPORTIONATE CONSUMPTION AND AN UNSUSTAINABLE SUPPLY CHAIN

The knock-on effects of this shortage are fairly predictable. Firstly, the UK now imports approximately 20% of its engineering know-how. Secondly, work packages are being exported abroad, directly impacting the bottom line of U.K. PLC (note recent Bank of England statements on risks to the economy). Thirdly, and perhaps of more immediate, operational concern for manufacturing companies, is the escalation of their fixed costs associated with employment. Engineering salaries in the UK rose by 9-14 percent between 2010 and 2013⁵, a period when average salary increases were around 2.5-3.5 percent. Furthermore, salaries for engineering graduates leaving UK universities are now 22% higher than other disciplines.

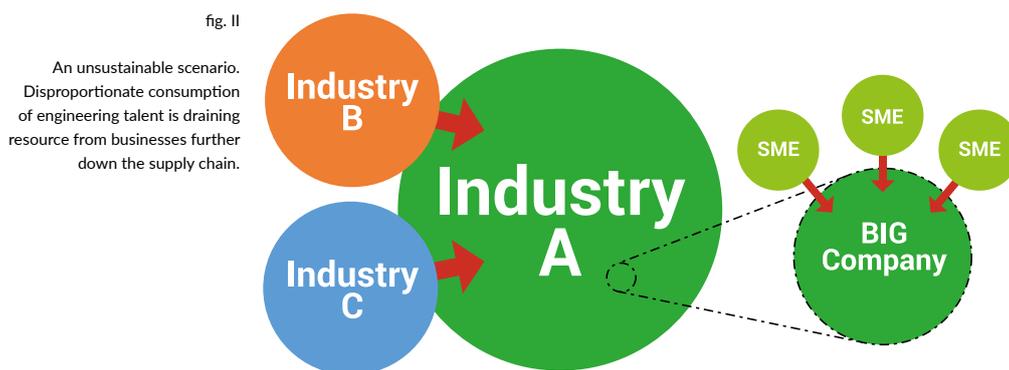
The upshot of this is that in a competitive market engineers are more expensive than ever to recruit and talent retention is more challenging than ever thanks to the inevitable churn associated with greater employee choice.

These conditions are driving a phenomenon which is putting the small and medium-sized

³ Oxford Economics Global Talent 2012

⁴ CBI / PEARSON Education & Skills Survey 2013

enterprise (SME) sector and manufacturers lower in the supply chain at a distinct disadvantage in the battle for talent. The bigger players including leading OEMs and Tier 1 suppliers are much better positioned to offer more attractive salaries, working conditions and career paths than smaller businesses. This is leading to a “disproportionate consumption” of engineering talent, whereby a smaller number of bigger organisations are able to attract and retain the largest proportion and the best engineering talent available on the labour market. And whilst this may seem to offer an advantage to OEMs and Tier 1 suppliers in the short term, in the longer term it is not sustainable. Those further down the supply chain will not have the engineering and design capacity to keep pace with demands from their own customers for more products, faster and better.



WHAT HAS BEEN DONE TO DATE?

If we acknowledge that there is a problem, that it's a significant one with serious implications for the global economy and that it's been identified as a priority by various government and industry stakeholders, how can it be that the gap is not closing but actually widening? The answer lies in how the problem is being tackled and the one-dimensional thinking applied to the situation to date.

Up to this point, the focus has been on trying to address the supply side of the problem – i.e. more young people must be encouraged to take STEM subjects at school, engineering courses at university, and to stay the course and enter the engineering profession upon graduation. On one level, tackling the problem by going back to its root cause is a logical approach, and training the next generation of engineers is obviously a crucial part of the long-term solution. However, the evidence suggests that the measures taken to date will not produce a solution of sufficient scale to bridge the predicted gap for 2020 and due to the inevitable time lag involved, neither does it provide a solution to meet the immediate, short-term or medium-term needs of manufacturers.

Even the actions taken to encourage up-take of engineering by those still in the education system are piece-meal and inadequate. This is despite the problem being firmly on the political agenda and supported by government funding and initiatives to provide more engineering apprenticeship opportunities. Unfortunately, these positive measures are countered by negative conditions earlier in a young person's educational journey, with factors such as the lack of STEM-qualified primary school teachers and inadequate career advice cutting short the supply of potential apprentices and undergraduates before they even leave the school room.

With insufficient, leaky talent supply and inadequate remedial measures for long-term sustainability, a different approach is required to solve the problem.

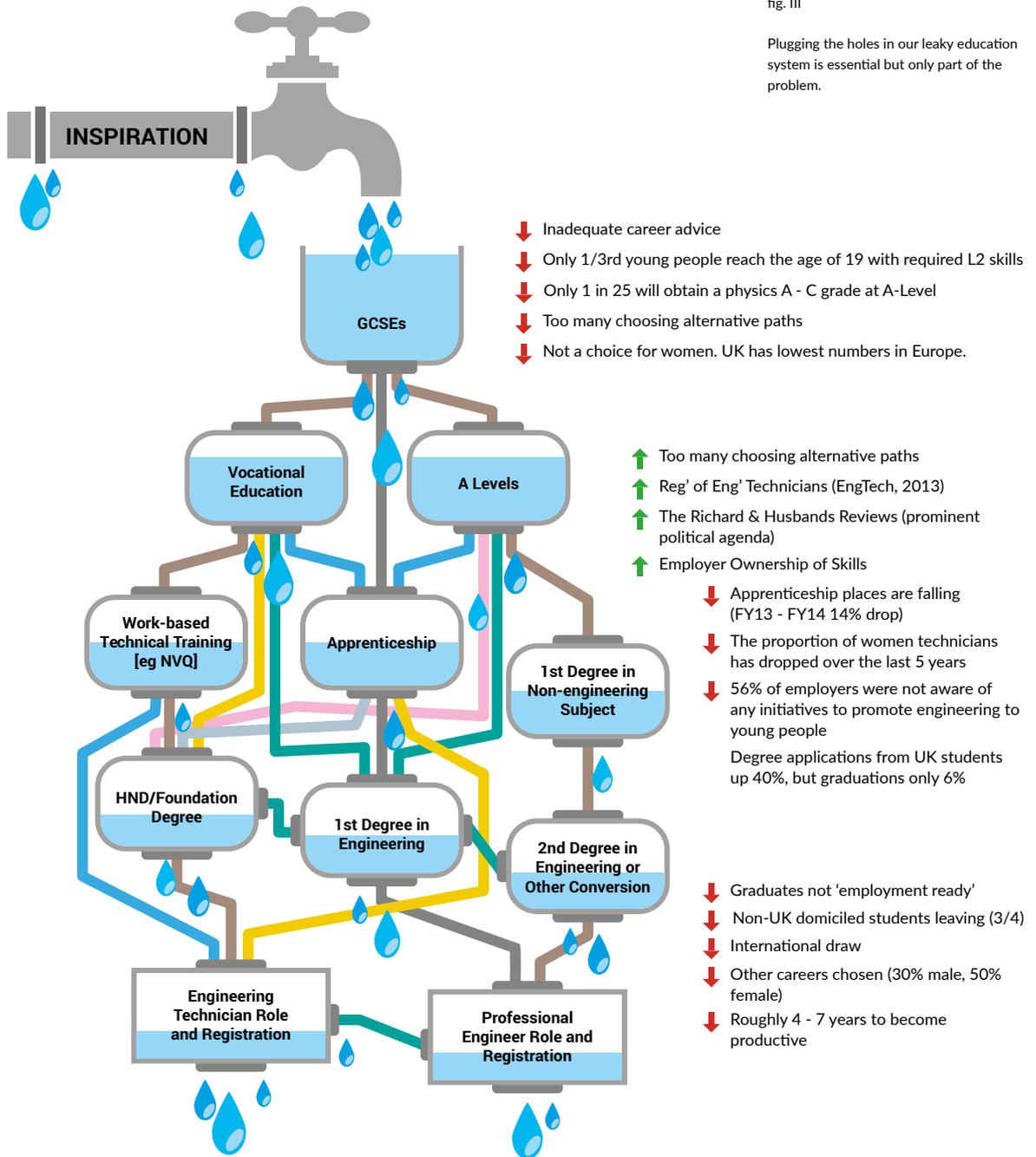


fig. III

Plugging the holes in our leaky education system is essential but only part of the problem.

IRRESPONSIBLE CONSUMPTION

Given the scale of the skills issue and the disruption to the manufacturing supply chain it heralds, a multi-faceted approach is required. Firstly, manufacturers need a short-term solution to address their immediate needs. Secondly, measures beyond the education system must be taken to complement what is already being done to address the supply side.

In fact, the answer is right under our noses.



It's a shocking but accurate statistic that on average 80 percent of an engineer's day is spent on tasks other than engineering. We call these "Essential but Non Value-Added" (ENVA) tasks. These are tasks that are essential to the product design and development process, but which do not require a qualified engineer to perform them. At a point where market demand for new products is higher than ever and manufacturers are struggling to recruit and retain engineering talent, we are using qualified engineering resources at just 20 percent of their professional capacity.

Whilst shocking, when looked at through a different lens, this "irresponsible consumption" actually offers manufacturers a realistic short-term solution, at least in part, to the skills shortage. But in order to unlock the potential and tap into the squandered capacity, they need a methodology for re-evaluating and redistributing how, where and by whom the tasks, activities and processes essential to product development are undertaken.

ENVA: WHAT IT IS AND HOW IT CAN HELP

The ENVA methodology accepts that tasks, activities and processes are essential to the development and manufacture of products, however it challenges if all these activities must be undertaken by a qualified engineer. Those that do not require engineering competency are classified as essential but non-value added in engineering terms.

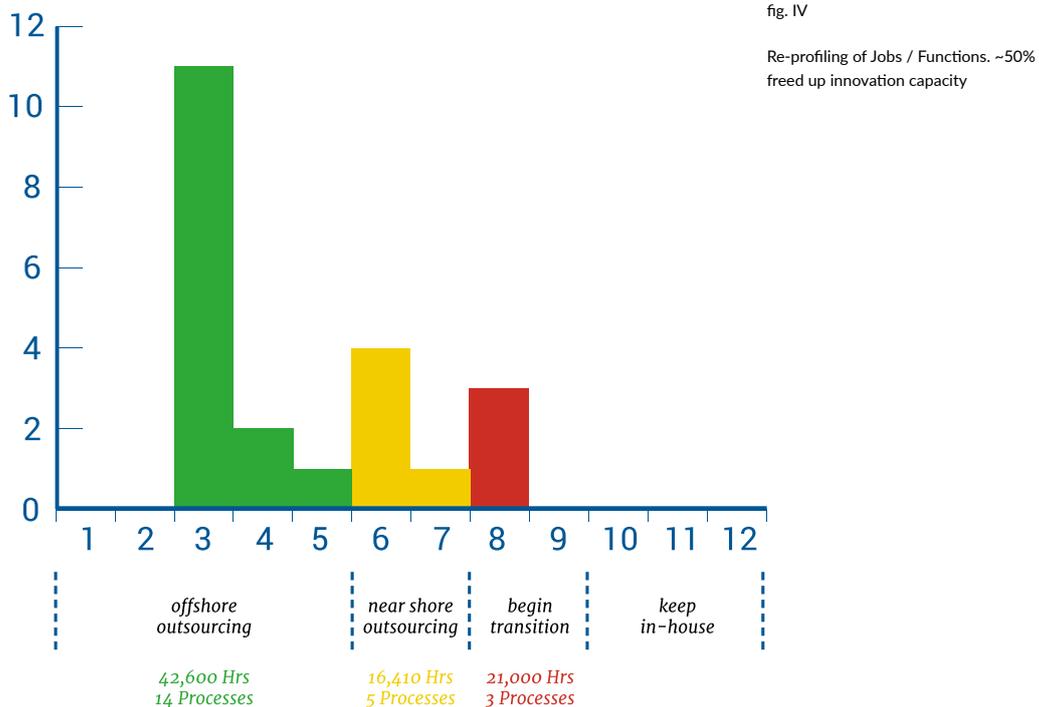
The ENVA methodology itself involves the detailed business process mapping of all activities currently associated with the engineering role(s) in the target business. Then, using a model that examines criteria such as business criticality, inter-process dependency, geographical dependency, process complexity, experience/skill level and core vs non-core (product differentiating), each element of the engineering role is de-constructed into groups that identify the need for the activity or process to be undertaken by the company's own resources (core), processes that must be done on-site, processes that need to be close but can be off-site, and processes that have no

geographical dependency at all. This forms an allocation map against which companies can make decisions about the most effective redistribution of all activities to create the desired capacity.

HOW DOES THIS WORK IN PRACTICE?

The example in fig. IV, shows the ENVA approach applied to the engineering release business process at a large aerospace supplier.

Global Design Modification Process at a Tier 1 Aerospace Supplier

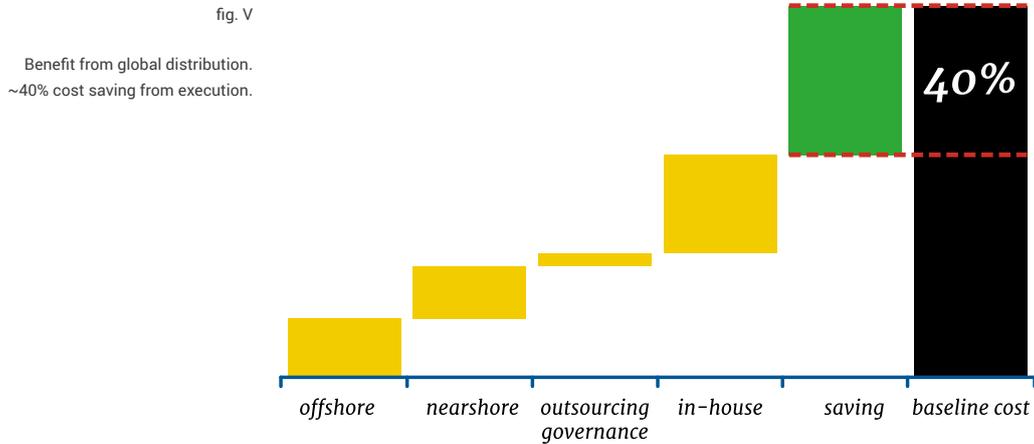


In this example, using clear process mapping and decision data, it was possible to redistribute more than 50 percent of the current engineering hours to non-engineering resources resulting in the release of critical engineering talent onto new programmes. Because geographical redistribution was also enabled through this process, the resulting cost of the redistributed operational model was 40 percent lower than before due to talent sourcing from “best cost” geographies.

This cost benefit assumes that productivity of individuals remains at the level as that prior to redistribution. However, while not immediately obvious from this example, further business benefit can be leveraged from work allocation theory; studies at Harvard Business School have demonstrated that the productivity of more able individuals, applied to higher complexity tasks is higher by a significant margin (you get the biggest bang for buck by applying your best resources to the toughest tasks!). The effective saving could therefore be much higher.

The ENVA model provides manufacturers with visibility of where they are deploying their engineering capacity and the choice to redistribute this either internally or externally depending

on their own unique requirements. Either way, it offers manufacturers the opportunity to drive increased efficiencies throughout the product development cycle, benefit from the resulting cost-savings and free up scarce engineering expertise, providing the capacity to innovate.



ENVA is one of a number of potential capacity-creation models. It is used in this paper to illustrate the immediate opportunity associated with embracing such a change. Businesses looking for complete efficiency and productivity improvements should consider the wider product realisation lifecycle and the benefits associated with optimising the process to create, and connected enterprise solutions.

CONCLUSION

How have we got to a position where scarce resources are being used in an inefficient manner? How have we found ourselves in a position where qualified engineering resources, those resources recognised as a profession in the same manner as doctors or lawyers or any number of other professions, are being used for only 20 percent of their professional capacity? The answer is complex, but some accountability, at least in part, can be assigned to the quest for lean product development practices, specifically the progressive consolidation of traditionally individual specialist roles (project management, quality checkers, administration, etc.) into single, all-encompassing engineering job descriptions, resulting in “integrated work teams with multiple competences”*.

There is certainly a benefit to removing handoffs between different functions, and no doubt that this approach has been a contributor to compressed development cycles and improved products. However, consolidation in the name of process efficiency can only work if you have enough resources to fulfil the new consolidated roles, where the required skill level to undertake the role is driven by the highest complexity activity in the scope of that consolidated job description. When the resource market can no longer satisfy demand through this consumption model then the model is broken and no amount of theory will overcome the resulting throughput deficit. The world has reached this threshold and the sustainable futures of businesses, along with the economies in which they operate, is increasingly at risk. It’s time to challenge lean product development paradigms and find other productivity models.



Tata Technologies makes product development dreams become a reality by designing, engineering and validating the products of tomorrow for the world's leading manufacturers.

Our clients are under increasing pressure to create **more** products, **faster** than before, and **better** than ever to stay competitive. For more than 20 years, we have empowered them with the tools, technology, and processes to meet and exceed market demands.

ABOUT TATA TECHNOLOGIES

Tata Technologies founded, in 1989, enables ambitious manufacturing companies to design and build better products through engineering services outsourcing and the application of information technology to product development and manufacturing enterprise processes.

With over 8,500 professionals, representing 28 nationalities, Tata Technologies focuses on the manufacturing industry - covering every aspect of the value chain from conceptualisation, manufacturing, aftermarket and maintenance repair overhaul support. Tata Technologies supports clients through engineering services outsourcing, product development, IT services and product management solutions.

Tata Technologies serves clients in 27 countries, with a delivery model specifically designed for engineering and IT engagements that offers a unique blend of deep, local expertise integrated with fifteen global delivery centres across Europe, North America and Asia Pacific.

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REVENUE**

**8,500+
PROFESSIONALS**

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AUTOMOTIVE
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