The Holy Grail of industrial strategy? England's continuing search for specialist technical institutions

This paper will consider the renewed political interest in industrial policy and its relationship to new specialist technical institutions, exploring the history and evolution of such institutions and the changes in policy that have identified, prioritised - and frequently abandoned - them. It considers the different roles of different types of 'technical' institution and describes how successive waves of national policy have seen the creation and ultimately the disappearance of Colleges of Advanced Technology, Polytechnics, Centre of Vocational Excellence (CoVEs), National Skills Academies (NSAs) and National Colleges. The paper also looks at new models of institution emerging without the direct support of central government including the Advanced Manufacturing Research Centre in Sheffield and the Warwick Manufacturing Group. All of these issues are discussed in the broader context of the UK's new industrial strategy, regional economic development and the continuation of major interregional inequality and weak economic performance in England. Ultimately the paper asks why there has been so much institutional reinvention in policymaking and what relationship this has to poor productivity performance in English and UK Regions.

Este artículo considera el renovado interés político por la política industrial y su relación con las nuevas instituciones técnicas especializadas, analizando la historia y evolución de dichas instituciones y los cambios en las políticas que las han identificado, priorizado y, con frecuencia, dejado al margen. Analiza los diferentes roles de los diversos tipos de instituciones «técnicas» y describe cómo sucesivas oleadas de políticas nacionales determinaron la creación y, en última instancia, desaparición de Colegios de Tecnología Avanzada, Politécnicos, Centres of Vocational Excellence (CoVEs), National Skills Academies (NSAs) y Colegios Nacionales. El artículo examina también nuevos modelos de instituciones que están surgiendo sin la ayuda directa del gobierno central, incluyendo el Advanced Manufacturing Research Centre en Sheffield y el Warwick Manufacturing Group. Todas estas cuestiones se analizan en el contexto más amplio de la nueva estrategia industrial de Reino Unido, el desarrollo económico regional y la persistencia de importantes desigualdades entre regiones y el débil funcionamiento económico de Inglaterra. Por último, el artículo se pregunta por qué ha habido tanta reinvención institucional en la formulación de políticas y qué relación tiene con el bajo rendimiento de la productividad en regiones inglesas y del Reino Unido.

Artikulu honek kontuan hartzen du industria politikarekiko interes berritua eta espezializatutako erakunde tekniko berriekin duen bere harremana; instituzio horien historia eta eboluzioa aztertuz. Eta, baita ere, industria politikak identifikatu, lehenetsi eta, sarritan albo batera utzi, dituzten politikan izan diren aldaketak aztertuz. Erakunde «tekniko» mota ezberdinen rol ezberdinak aztertzen ditu. Eta deskribatzen du nola bata bestearen atzetik izan ziren politika nazionalen boladek eragin zuten ondorengoen sorrera eta desagerpena: Teknologia Aurreratuen Eskolak, Politeknikoak, Centres of Vocational Excellence (CoVEs), National Skills Academies (NSAs) eta Eskola Nazionalak. Artikuluak gobernu zentralaren laguntzarik gabe sortzen ari diren erakunde eredu berriak ere aztertzen ditu, Warwick Manufacturing Group eta Sheffield-en dagoen Advanced Manufacturing Research Centre barne. Kontu horiek guztiak aztertzen dira Erresuma Batuaren industria-estrategia berriaren, eskualdeko garapen ekonomikoa eta eskualdeen arteko desberdintasun handien mantentzearen eta Ingalaterraren funtzionamendu ekonomiko ahularen testuinguru zabalago batean. Azkenik, artikuluak galdegiten du politiken formulazioan zergatik egon den horrenbesteko erakunde berrasmatzea, eta zer lotura duen Erresuma Batuko eta eskualde ingelesen produktibitate eskasarekin.

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1. INTRODUCTION

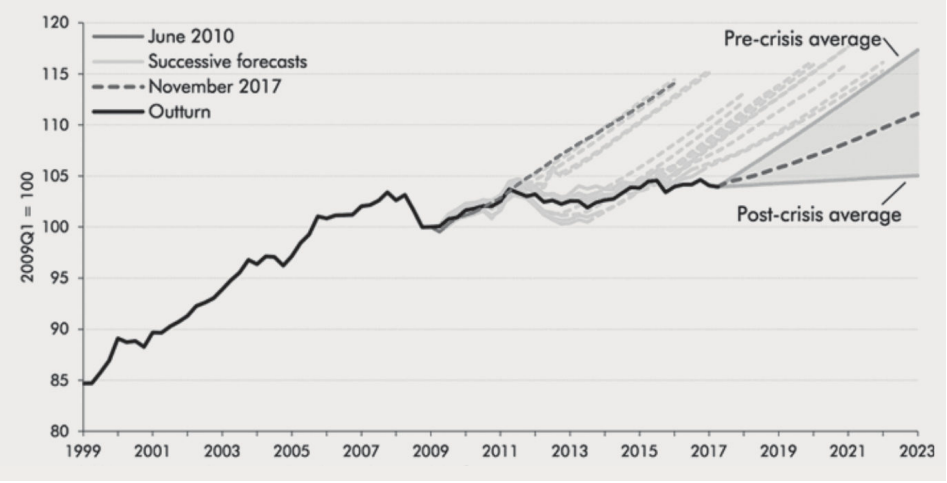
In the summer of 2016, shortly after the UK voted to leave the European Union and David Cameron's subsequent resignation, Theresa May became Prime Minister. Inheriting his small parliamentary majority from the 2015 General Election, she immediately introduced a new structure in Whitehall, creating Departments for Exiting the EU (DEXEU), International Trade (DIT) and for Business, Energy and Industrial Strategy (BEIS). This marked the full rebirth of industrial strategy in UK politics, finally emerging from what Richard Jones of Sheffield University describes as «*the rhetoric about uncompetitive industries producing poor-quality products, kept afloat by oceans of taxpayers' cash*».

«*This new mood has been a while developing. It began with the 2007-8 financial crisis. The economic recovery following that crisis has been the slowest in a century; a decade on, with historically low productivity growth, stagnant wage growth, and no change to profound regional economic inequalities, coupled with souring politics and the dislocation of the United Kingdom's withdrawal from the European Union, many people now sense that the UK economic model is broken*».[1]

[1] Jones R, «The Second Coming of Industrial Strategy», Issues in Science and Technology, 2018.

As Jones (2018) and the Industrial Strategy Commission (2017) point out, the UK historically has an uncomfortable and episodic relationship with both the language and the practical choices of industrial policy. For several decades – from the late 1970s to the late 2000s – successive UK governments shied away from the idea of the state as an active «framer» in its economy, preferring a more laissez faire approach to the economy. This has largely been the case in both sectoral and geographical terms.

Chart 1. **PRODUCTIVITY GROWTH (OUTPUT PER HOUR) – FORECASTS AND OUTTURNS (OFFICE FOR BUDGET RESPONSIBILITY 2017**



Note: Solid lines represent the outturn data that underpinned the forecast.
Source: ONS, OBR.

However, following the financial crisis and subsequent recession, successive UK governments (including devolved administrations in Wales, Scotland and Northern Ireland) have helped to usher in a rebirth of the language and actions of industrial policy. This has most recently culminated in the establishment of a Department for Business, Energy and Industrial Strategy and an Industrial Strategy White Paper[2] aiming to improve productivity through the «five foundations» of business environment, infrastructure, ideas, people, places and sectors. More prosaically perhaps, in her foreword to the earlier consultation paper, Theresa May had described the previous summer's referendum «*not simply as a vote to leave the EU, (but) as an instruction to the Government to change the way our country works – and the people for whom it works – forever*».[3]

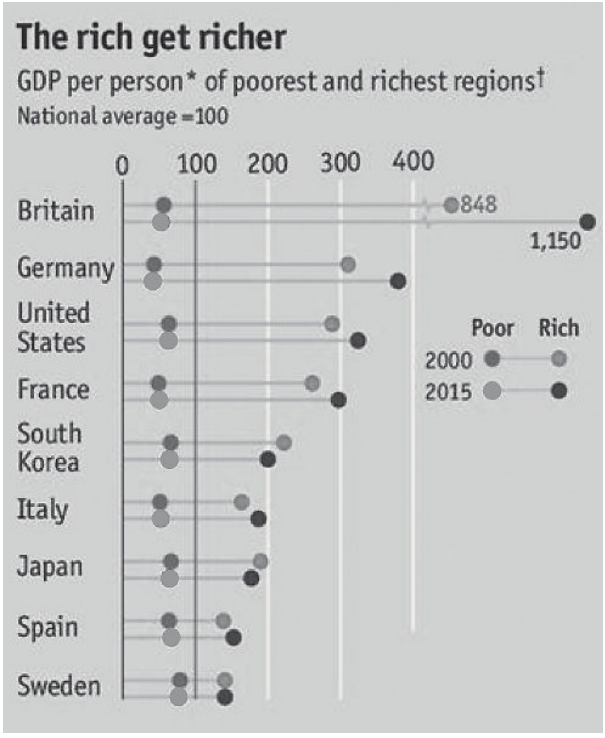
[2] BEIS, 2017, «Industrial Strategy: Building a Britain Fit for the Future», available at: https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future

[3] Theresa May, Foreword to «Building Our Industrial Strategy», BEIS, 2017. Available at: https://beis-govuk.citizenspace.com/strategy/industrial-strategy/supporting_documents/buildingourindustrialstrategygreenpaper.pdf

There are two key aspects underlying the UK's need for such a focus and definition of industrial strategy. The first is long term productivity weakness exacerbated by the recent lack of return to even pre-crisis growth rates. This is shown in Chart 1 below, in the context of adjusted growth forecasts from the Office for Budget Responsibility[4] following over optimistic predictions in recent years.

The second, as highlighted by the independent Industrial Strategy Commission[5], relates to significant regional inequality in the UK. This is also a longstanding problem and contributes to poor national productivity as a whole and despite the attention of policymakers, continues to grow. See Chart 1.

Chart 2. **GDP PER PERSON OF POOREST AND RICHEST REGIONS** [6]



* At purchasing-power parity, 2010 prices. † OECD lower-level regions and US states.

Sources: OECD; *The Economist.*

[4] Office for Budget Responsibility, Autumn Budget documents, HM Treasury 2017.

[5] The Industrial Strategy Commission was an independent policy research inquiry led by Dame Kate Barker and the Universities of Manchester and Sheffield. Further details and its reports can be found at www.industrialstrategycommission.org.uk

[6] The Economist, «How the Other Three Quarters Live» 17th September 2016.

A key part of the UK's Industrial Strategy, rightly, is a focus on human capital and particularly the UK's technical education system. Considered to be an area of longstanding weakness[7], this is a policy area that hasn't been short of reform or government intervention. But the amount of policymaking effort in this area has rarely been matched with popular headlines or sustained political interest. In many ways it is the least stable policy area in the UK.

In a recent report from the Institute for Government[8], further education and skills reform is described as «*the worst failure of domestic British public policy since the Second World War*». It concluded that the plans to develop new «T Levels» (recommended following a review led by Lord Sainsbury[9] will be the twenty-ninth major reform of vocational education since the early 1980s. In less than four decades, there have been twenty-eight major pieces of legislation, forty-eight Secretaries of State with relevant responsibilities and no organisation focused on skills policy has survived longer than a decade (Norris and Adam, 2017).

Each has largely failed to solve some of our most stubborn education problems. The UK's technical education system has long been weak by international standards. In basic skills, England is the only country in the OECD where 16 to 24-year olds are «no more literate or numerate than 55-64 year olds». Only 10% of 20-45 year olds hold technical education as their highest qualification, placing the UK 16th out of 20 OECD countries. By 2020, the UK is set to fall to 28th out of 32 OECD countries for intermediate (upper-secondary) skills.

England in particular has a weak technical sector, largely underfunded, hardly noticed, and run in totally different and disconnected ways from both the higher education and school sectors that sit either side of it.

The Leitch Review (2006) concluded that this poor record is the cause of around one-fifth of our productivity gap with France, Germany and the United States[10]. The UK is often described as existing in a «low skills equilibrium» (Finegold and Soskice, 1988)[11] with many firms, sectors and locations designing products and services based on low skilled and less productive workforces, simply because different ap-

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[7] See for example the Leitch Review (HM Treasury 2006).

[8] Norris E, and Adam R, All Change: Why Britain is so prone to policy reinvention and what can be done about it, Institute for Government, 2017. Available at: https://www.instituteforgovernment.org.uk/publications/all-change

[9] DFE (2016): Skills Plan and Independent Review on Technical Education (led by Lord Sainsbury) Available at: https://www.gov.uk/government/publications/post-16-skills-plan-and-independent-report-on-technical-education

[10] The Leitch Review, «Prosperity for All in a Global Economy» HM Treasury (2006): http://webarchive.nationalarchives.gov.uk/+/http:/www.ukces.org.uk/upload/pdf/2006-12%20LeitchReview1_2.pdf

[11] Finegold D and Soskice R, «The Failure of Training in Britain: Analysis and Prescription» *Oxford Review of Economic Policy* (1988) Vol. 4, issue 3, 21-53

proaches are impractical. The OECD found that this problem is even more sharply evident in certain parts of the UK[12].

Longstanding issues of low productivity, regional inequality and poor technical education performance are now amplified by the economic and political forces of Brexit. Since the Referendum a series of political commentators have offered ideas of how to rebuild an obviously - and nearly equally divided - country. Central to suggestions from both left and right has been the rebuilding of vocational education and good quality, skilled jobs - especially in those towns, cities and regions that have suffered most amidst waves of deindustrialisation, globalisation and economic restructuring. Vernon Bogdanor (2017)[13], Miranda Green (2017)[14] and David Goodhart (2017)[15] are three commentators that have recommended investment in technical training to create a better trained domestic workforce, underpinning the industrial strategy and tackling the «left behind» agenda.

The politics of Brexit is therefore shining a new light on an old problem. As we have already seen, the UK has suffered from a gap in our education and training system for decades - perhaps even hundreds of years. We've always been rather better at «education» than «training». As Vince Cable remarked in a speech too close to the end of his tenure as Secretary of State at BIS (neither he, his party nor his department are around to shape this version of industrial strategy), this is an issue that is part of the future for both Further and Higher Education sectors. He describes an «upper technical» vacuum as a problem that lies across both sectors as well as in teaching and research.

«Our post-secondary education has become distorted. The OECD concluded that our post-secondary vocational sub-degree sector is small by international standards – probably well under 10% of the youth cohort, compared to a third of young people elsewhere. In the US, more than 20% of the workforce have a post-secondary certificate or an associate degree as their highest qualification. In Austria and Germany, sub-degree provision accounts for around 50% of the cohort. In South Korea, one-third of the youth cohort enters junior college on 2-year programmes of higher vocational training.

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[12] OECD, «Skills for Competitiveness» (2012): http://www.oecd.org/cfe/leed/skills%20for%20competitiveness%20uk%20report.pdf

[13] «Enlightened education policy will lift up the left behind» Vernon Bogdanor: http://app.ft.com/cms/s/7f49b034-7126-11e6-a0c9-1365ce54b926.html

[14] «To build a shared society, focus on technical skills education», Miranda Green, Financial Times https://www.ft.com/content/8f4d27f4-d80a-11e6-944b-e7eb37a6aa8e

[15] «Here's how to reform immigration to ensure better paid, better trained Britons», David Goodhart http://www.telegraph.co.uk/news/2016/09/12/heres-how-to-reform-immigration-to-ensure-better-paid-better-tra/

Elsewhere, countries with low volumes have sought to address the problem. Sweden, for example, trebled its numbers in higher VET programmes between 2001 and 2011».[16]

Many ideas and reforms have tried and failed to address these issues, often through major institutional changes. From Samuelson and Forster in the 19th Century, Butler, Robbins and Crosland in the 20th and Leitch and Sainsbury in the 21st, we haven't been short of recommendations from major reviews and commissions for new institutional solutions. Crosland's answer was the Polytechnic. Before that it had been Colleges of Advanced Technology. In the later years of New Labour it was Centres of Vocational Excellence and then National Skills Academies. Vince Cable offered both National Colleges and Catapult Centres for applying technical research. The Coalition came to an end and Cameron's brief honeymoon as Prime Minister in a Conservative majority government saw the taking up of Labour's ideas of Institutes of Technical Excellence and Technical Degrees into Institutes of Technology.

These longstanding deficiencies in skills within the UK and compared to other countries in the EU and the OECD, have not been solved – or indeed helped – by the unparalleled chopping and changing of institutions and policy mechanisms in qualifications and local and sectoral organisations. Infamously, as the Institute for Government found in England we are now embarking on our twenty-ninth major piece of skills «reform» since the early 1980s[17].

During the 1980s, alongside a wave of market reforms, the Thatcher government oversaw the replacement of Industrial Training Boards and the Manpower Services Commission with Training and Enterprise Councils. New Labour created a University for Industry (now struggling on as a privatised Learndirect[18]), the Learning and Skills Council – a national organisation funding, regulating and planning skills and Regional Development Agencies (RDAs), charged with economic development.

The Conservative led Coalition Government (2010-2015) and the Conservative Government (2015 onwards) have continued the policy attention in this area with the abolition of RDAs and the introduction of Local Enterprise Partnerships (LEPs) covering a varied set of areas loosely following local economic geographies. Devolution was further driven by then Chancellor George Osborne with his ideas of a «Northern Powerhouse» and a «Midlands Engine» and for a wave of elected «Metro Mayors» leading English city regions. After several «Devo deals» including some powers over skills and economic development, Mayors and Combined Authorities are now in place in Greater Manchester, the Liverpool City Region, the

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[16] Vince Cable speech 2014 «Where next for Further and Higher Education?» https://www.gov.uk/government/speeches/where-next-for-further-and-higher-education

[17] Norris E and Adam R, «All Change: Why Britain is so prone to policy reinvention, and what can be done about it» Institute for Government (2017)

[18] Linford, N, «Damning Evidence Mounts against Learndirect», FE Week, 15 September 2017, available at http://feweek.co.uk/2017/09/15/damning-evidence-mounts-against-dfe-over-learndirect/.

West Midlands, the Tees Valley, Cambridgeshire and Peterborough and the West of England. A further Mayoral election has now taken place in the Sheffield City Region.

Alongside these changing institutional arrangements, there have been just as many reforms to qualifications, curriculum, funding and regulation. There have been major reforms to GCSEs and A Levels (core school qualifications at Levels 2 and 3), 14-19 Diplomas, NVQs (National Vocational Qualifications), GNVQs (General National Vocational Qualifications) – and now «T Levels» following the recent Sainsbury Review (2016)[19].

Workforce training policy has also seen significant upheaval, with many changes to apprenticeships as well as to other adult training programmes such as Individual Learning Accounts and Train to Gain. Higher Education has also witnessed equally dramatic reforms, with more universities established, and greater competition within the sector encouraged. An increase in the numbers studying in higher education has been one of the results – but so is a major decline in both part-time and work-based learning, as well as non-honours degree programmes including higher technical qualifications such as HND (Higher National Diploma) and HNC (Higher National Certificate), and Foundation Degrees[20].

So is this likely to be a period of stability in our institutional landscape, as well as in curricula, qualifications, funding and regulation? History would suggest not. In Theresa May's ill-fated decision to call a General Election in 2017, the Conservative Manifesto promised to rethink the balance between universities and technical education with a series of pledges to boost the latter and rethink the former. Given that amongst the last legislative actions of her previous Conservative administration had been to pass a Higher Education and Research Act as well as a Technical and Further Education Act, this represented rapid change even by recent standards.

2. INSTITUTES OF TECHNOLOGY

In early 2017, a relatively small £170 million of capital funding was made available for existing institutions in the Further Education (FE) sector to develop new specialist facilities and a new «kite-mark». The government had first announced plans for the institutes in April 2015, then again in its post-16 skills plan in July. The Industrial Strategy Green Paper confirmed that a new £170 million in capital funding

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[19] For a detailed description of the various qualifications and levels currently available in England see Table 1 on page 142.

[20] See «Higher Education in England: Key Facts», HEFCE (2017): http://www.hefce.ac.uk/media/HEFCE,2014/Content/Pubs/2017/201720/HEFCE2017_20.pdf and also Wolf, A 'Remaking Tertiary Education: can we create a system that is fair and fir for purpose?', Education Policy Institute, (2016): http://epi.org.uk/wp-content/uploads/2016/11/remaking-tertiary-education-web.pdf

was to be spent on creating Institutes of Technology to «*increase the provision of higher-level technical education' and ensure that they were available 'in all areas*'»[21].

But the 2017 General Election manifesto revealed a much more far reaching agenda, placing May's plans alongside the most ambitious of previous institutional reforms in this area. However, as with many previous attempts designed to boost technical education and applied research, these previous reforms have tended to begin with fanfares and high expectations but ultimately change course with new institutions adopting more traditional missions and mainstream sectoral identities. It included recommendations for a new wave of reforms including the creation of new Institutes of Technology, Local Skills Panels and an accompanying 'Major Review of Tertiary Education'.

«*We will establish new institutes of technology, backed by leading employers and linked to leading universities, in every major city in England. They will provide courses at degree level and above, specialising in technical disciplines, such as STEM, whilst also providing higher-level apprenticeships and bespoke courses for employers. They will enjoy the freedoms that make our universities great, including eligibility for public funding for productivity and skills research, and access to loans and grants for their students. They will be able to gain royal charter status and Regius Professorships in technical education. Above all, they will become anchor institutions for local, regional and national industry, providing sought after skills to support the economy, and developing their own local identity to make sure they can meet the skills needs of local employers*». (Conservative Manifesto 2017).

To do this, these new technical institutions were to «*enjoy the freedoms that make our universities great*», including access to research funding, loans and grants. Just like the vision for polytechnics in the 1960s, «*they will become anchor institutions for local, regional and national industry, providing sought after skills to support the economy, developing their own local identity*».

The «Major Review of Post 18 Education» promised in the Conservative Manifesto was finally launched on 19th February 2018 with a repeated promise to site a «new network of Institutes of Technology» in a wider tertiary system. The Major Review[22] and the preceding 2017 manifesto pledges raises several questions for the future of universities and the regulatory and funding systems that support them as well as for the Further Education sector. New technical institutions look like a major challenge to

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[21] Offord P and Robertson A, «Institutes of technology Windfall Going to Existing Providers», (2017) FE Week https://feweek.co.uk/2017/01/29/institutes-of-technology-170m-windfall-going-to-existing-providers/

[22] Major Tertiary Review published 19th February 2018. Terms of Reference available here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/682348/Post_18_review_-_ToR.pdf and PM speech here: https://feweek.co.uk/2018/02/19/he-funding-review-launch-read-the-prime-ministers-speech-in-full/

both. But prior to the Election being called and the Conservative manifesto written, the discussions around Institutes of Technology, though headlined in Budgets and various education policy statements had appeared a rather more modest initiative.

In November 2017, the Department for Education (DFE) published a prospectus inviting bids to form Institutes of Technology «*by facilitating the coming together of employers, further education (FE) providers and higher education (HE) providers to create a new breed of prestigious institution capable of delivering higher level technical education and skills*».[23]

In the prospectus, there is also a high-level explanation of why the Government believes that Institutes of Technology are required:

«*There are gaps in technical provision in this country, particularly in STEM (science, technology, engineering and mathematics) skills, which means that some people could be ending their education and training earlier than they need to or pursuing a route less suited to their skills. Others do not take technical routes, as they are not perceived to be valued as highly as academic routes*».

«*The UK has lower levels of productivity compared to other advanced economies, and we also have considerably lower uptake of higher level professional and technical education. In particular, we have a shortage of technicians at levels 4 and 5 (in between A levels or equivalent, and graduate level) and not enough people undertaking training at this level*».

The Government expects that the creation of Institutes of Technology will «*significantly increase the number of learners with higher level technical skills, which are crucial to national, regional and local productivity growth*». There is considerable evidence to support both the importance of higher level technical skills in the UK labour market as well as the weaknesses of the current Further and Higher Educations systems in providing them – see for example the identification of specialist skill shortages by the UK Commission for Employment and Skills[24] (2016) and the decline in students numbers discussed at length by Alison Wolf et al (Education Policy Institute, 2016). But whether the proposed Institutes of Technology are the right policy intervention to improve the supply and utilisation of such skills is a wholly different matter.

The idea of an Institute of Technology offering higher level technical training is not uncommon in other countries. Germany's *Fachhochschulen*, sometimes known as Universities of Applied Science are tertiary education institutions specialising in technology or engineering subjects. Universities of Applied Sciences are primarily designed with a focus on teaching professional skills. Swiss law calls *Fachhochschulen*

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[23] Institutes of Technology Prospectus, DFE 30th November 2017 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/663691/DfE_IOT_Prospectus_Nov17.PDF

[24] UKCES (2016), Employer Skills Survey 2015 available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/525444/UKCESS_2015_Report_for_web__May_.pdf

and *Universitäten* «separate but equal». *Universitäten* and *Fachhochschulen* award legally equivalent academic bachelor's and master's degrees. Universities of Applied Science of this model can also be found in Switzerland, Austria and Irish *Institutes of Technology* and Norwegian *University Colleges* also have a similar focus.

«To ensure that further, technical and higher education institutions are treated fairly, we will also launch a major review of funding across tertiary education as a whole, looking at how we can ensure that students get access to financial support that offers value for money, is available across different routes and encourages the development of the skills we need as a country».

Table 1. **THE QUALIFICATIONS FRAMEWORK (ENGLAND 2016)**

Level	Examples (mainstream academic)	Examples (technical, vocational, and 'applied academic')
SUB-TERTIARY LEVELS		
Entry	Entry level literacy, numeracy, English as a Second Language	
1	GCSE (grades D-G)	NVQ level 1 BTEC award level 1 (offered mainly as part of school system and remedially as part of FE sector).
2	GCSE (grades A*-C)	BTEC award, certificate and diploma level 2 NVQ level 2 (offered mainly in school and FE sectors).
3	AS and A level International Baccalaureate	BTEC award, certificate and diploma level 3 (BTEC National) NVQ level 3 City & Guilds craft awards (offered by both school and FE sectors).
TERTIARY LEVELS		
4	Certificate of higher education	Higher National Certificates (HNC) NVQ level 4 Technician and chartered technician awards (e.g. Accounting Technician level 4) Largely offered in FE Sector (and in some HE institutions).
5	Foundation degrees Diplomas of higher education	Diploma of further education, Foundation degree, Higher National Diploma (HND) . Largely offered in FE Sector and in some HE institutions.
6	Bachelor's degree with honours	Offered mainly in universities with degree awarding powers (and also by FE colleges and other institutions with degrees franchised from universities.
7	Master's degree Postgraduate certificate/diploma	Final professional qualification (chartered professions) Offered mainly in Universities.
8	Doctorate	Offered mainly in Universities with Research Degree Awarding Powers.

Source: Own elaboration.

3. THE FURTHER EDUCATION SECTOR IN ENGLAND

There are 209 General Further Education (FE) colleges in England providing academic, technical and professional education and training for young people, adults and employers. FE Colleges are the main vocational sector in England and educate and train 2.7 million people annually, though only a relatively small number - 153,000 - are studying higher education qualifications and other 'tertiary' programmes.

Most FE colleges are general with a comprehensive focus - but 26 are designated as specialist – mainly in the land based/agriculture sectors. General FE colleges tend to offer a similar range of subjects including engineering, catering and hospitality, IT, construction, hair and beauty, business and the creative arts. They offer a wide range of qualifications and training programmes including academic and technical, including apprenticeships, but mainly at lower and upper secondary levels (levels 2 and 3). FE colleges are nationally funded and regulated[25] through the Education and Skills Funding Agency (ESFA) in England – offering national qualifications approved by government and developed by independent awarding bodies such as City and Guilds and Pearson.

Historically, like many Universities, FE colleges in England emerged from Mechanics Institutes developed locally by employers and local authorities during the 18th and 19th centuries. In 1965 Tony Crosland, the then Labour Education Secretary responding to the Robbins Review of Higher Education 1963, formally created a linear technical sector of technical FE colleges and polytechnics under local authority control (or the 'binary system' of higher education as often described).

In 1992 the Further and Higher Education Act enabled polytechnics to become universities with degree awarding powers and also took both them and FE colleges from local authority control to independent incorporated status governed and funded in a national system. In more recent years, since 1997, the number of colleges has decreased as a series of mergers have seen larger colleges and college groups created. Sometimes this has been organic and other times eg during the «Area Based Reviews» of 2015-18[26] as an explicit goal of national policy. This phase has seen the further reduction in the number of small and specialist institutions in the FE sector.

There have been a number of attempts to increase technical specialisation within the FE sector. In recent years these have included the creation and/or designation of Centres of Vocational Education (CoVEs), National Skills Academies (NSAs) and National Colleges, though the sector has become more based on larger, general in-

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[25] From 2019 a number of Mayoral Authorities in England will gain limited control of the Adult Education Budget for 19+ learners.

[26] Area Based Reviews: See https://www.gov.uk/government/publications/reviewing-post-16-education-and-training-institutions-list-of-area-reviews/reviewing-post-16-education-and-training-institutions-area-reviews-waves-1-to-5

stitutions offering comprehensive vocational provision. As a result of different waves of reforms and incentives the sector has increased general provision at lower levels and for younger age groups at the expense of older age groups, specialist provision and higher level technical qualifications. As Alison Wolf *et al.* (2017) describe, this has created a powerful and largely uninterrupted drift away from the demand for and supply of specialist technical learning.

«*English FE colleges have become completely different from the dedicated technical institutions which are common in other European countries, or from the community colleges of the United States. While the latter are clearly tertiary in their concerns, dealing with people who have completed a full school-based education and are moving to the next stage of education and training, English colleges have become less and less so*».

«Tertiary» education starts, essentially, at level 4 and level 3 is part of the «upper secondary» level equivalent to A Levels or other academic qualifications studied in schools, FE colleges and 6th Form Colleges (see Table 1 above). Although Level 3 is important to the economy, especially when studied aged 16-19, it also increasingly offers progression to more vocationally orientated higher education courses though these tend to be honours degrees rather than distinct vocational or technical awards.

FE Colleges have seen increasing proportions of their income delivered through Levels 2 and 3 («secondary» and «upper secondary») and less through «upper technical» or tertiary qualifications. This is also the case for adults and part time students. As Wolf *et al.* observe, «*for over three decades now, central government policy has promoted large volumes of low-level vocational qualifications in the non-university adult sector, at the expense of tertiary-level qualifications or even full craft awards at level 3*».[27]

4. HOMOGENISING HIGHER EDUCATION

In early 1960s Lord Robbins recommended a dramatic expansion of higher education[28]. This included plans for many more students as well as for many more universities. The Robbins Committee recommended the establishment of a series of new universities and also that existing specialist institutions including Colleges of Advanced Technology (CATs) become universities (see Box 2 below). The then Labour Secretary of State for Education and Science, Anthony Crosland, envisaged a «binary system» of autonomous universities, and a public sector of technical and other further education colleges. The policy was aimed at meeting the needs of industry through upgrading the status of technical education so that it equalled that of existing and new universities.

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[27] Wolf *et al.* (2017) ibid.

[28] Committee on Higher Education (1961-63), Chaired by Lord Robbins and available at: http://www.educationengland.org.uk/documents/robbins/robbins1963.html

The subsequent White Paper, «A Plan for Polytechnics and Other Colleges»[29] was published in 1966, recommending the designation of colleges as regional polytechnics to form a nation-wide network for technical education. In Crosland's plan the polytechnics would be «large and comprehensive» providers of full-time, part-time and sandwich courses of technical and vocational higher education and the paper eventually led to the designation of some thirty institutions as polytechnics. When in 1992 these were brought together into a single funding and regulatory system under John Major's Further and Higher Education Act[30], many were worried that polytechnics becoming universities would lead to «academic drift» and that technical specialisation and capacity would be lost [31].

Since that time many more universities have been created – with the number more than doubling since the early 1960s - including a number of private universities in recent years. This has included small and specialist institutions specialising in agriculture, arts, law, business etc. But concerns about «academic drift» persist. Not least as numbers of part time, work-based and non-honours degrees have plummeted. As David Willetts (2017) and others have observed, the model for funding research as well as the model for funding undergraduate tuition, has had a series of homogenising (and damaging) effects on the diversity of institutions, participation and provision in both research and teaching.

Recent funding reforms have further concentrated provision around the university based, full time honours degree. Today the UK – and particularly England – has the most monolithic higher education provision in the OECD. John Gill, the editor of *Times Higher Education has* pointed out, «*the relentless focus on funding the 18-year-old full-time undergraduate has been at the expense of coherent policy in other areas*».[32]

Following the 2010/11 Higher Education reforms introduced by Willetts as the then Conservative Higher Education and Science minister, the shape of the sector has changed rapidly. While the number of entrants to full-time first degree, postgraduate taught and postgraduate research courses have increased considerably since 2006–07 (by 31.2%, 30.5% and 25.7% respectively), the number of entrants to part-time first degree and postgraduate taught courses declined, as did the number of entrants to both full-time and part-time other undergraduate courses.

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[29] Department for Education and Science (1966) «A Plan for Polytechnics and Other Colleges». Available at: ahttp://filestore.nationalarchives.gov.uk/pdfs/small/cab-129-125-c-70.pdf

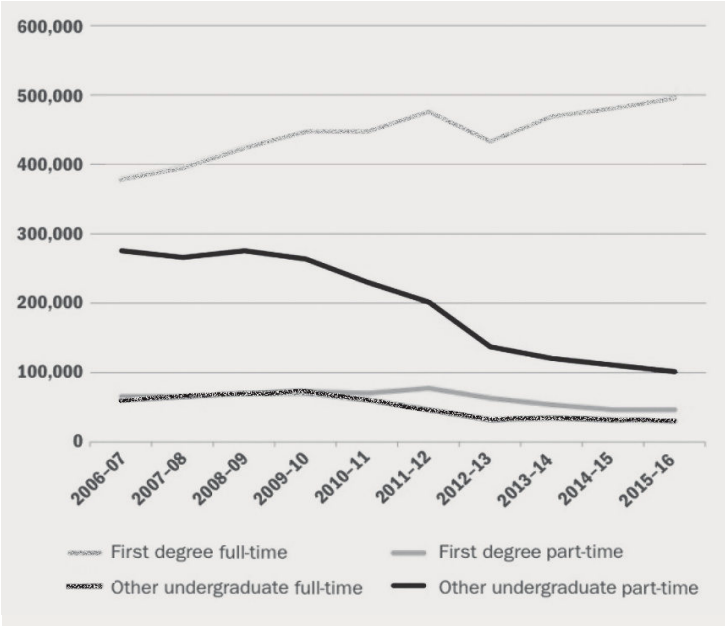
[30] The Further and Higher Education Act (1992) http://www.legislation.gov.uk/ukpga/1992/13/pdfs/ukpga_19920013_en.pdf

[31] Scott P, «It is twenty years since polytechnics became universities and there is no going back», 3rd September 2012, The Guardian https://www.theguardian.com/education/2012/sep/03/polytechnics-became-universities-1992-differentiation

[32] Gill J, (24th April 2014), «A Little Lift Could Help Everyone», Times Higher Education http://www.timeshighereducation.co.uk/comment/leader/a-little-lift-could-help-everyone/2012858.article

The number of entrants to part-time first degree courses fell by 28.6% between 2006-07 and 2015-16, with most of this decline occurring between 2011–12 and 2014-15 following the introduction of undergraduate tuition fee reforms. Since 2006-07, the number of entrants to other undergraduate courses has fallen considerably, with 49.7% fewer full-time and 63.1% fewer part-time entrants to these courses in 2015-16 (See Charts 3 and 4 below).

Chart 3. **ENROLMENT IN HIGER EDUCATION BY MODE & PROVISION IN ENGLAND 2006-7 TO 2015-16**[33]



Source: Own elaboration.

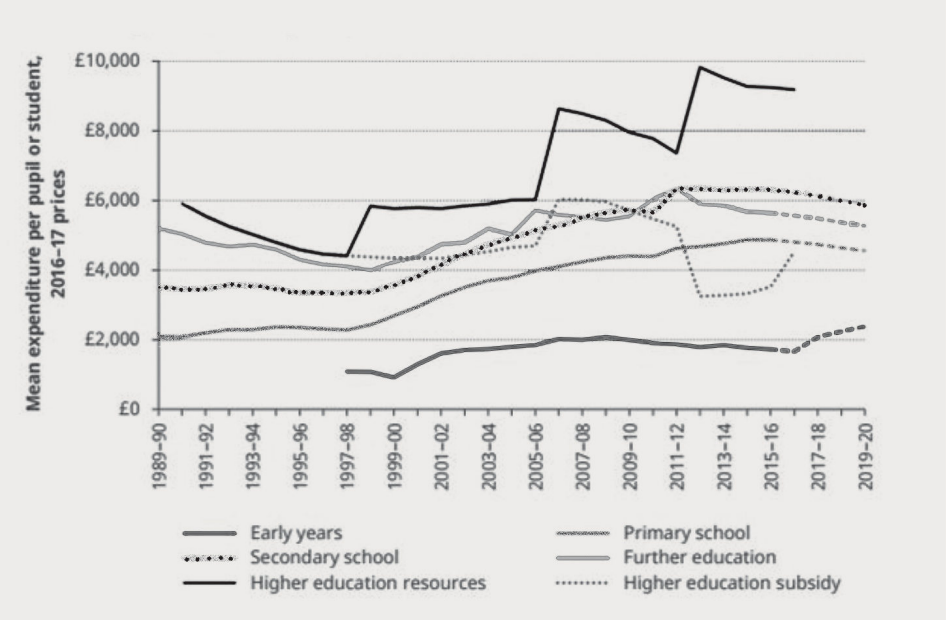
Some of the provision that might be reasonably expected in a specialist technical institution and common in other international examples is in significant decline in England. This includes part time and mature enrolments, work-based studies and non-honours degree programmes offering «upper technical» qualifications.

There will then be a need for careful consideration of the financing of technical institutions and education and perhaps the reversal of recent trends in funding for Further and Higher Education. As the Institute for Fiscal Studies have shown (see Chart 5 below), it is the latter sector that has benefitted most from recent policy decisions and political priorities. They and others (Wolf, 2017) also show the growing

[33] Universities UK (2017) Higher Education Facts and Figures.

gap between FE and HE funding levels. Institutes of Technology will have to survive in these challenging market conditions and the Conservatives' «major review of tertiary education» will, as promised, have to look very carefully at funding models and institutional and individual incentives if they are not to go the way of previous institutional reforms.

Chart 4. **SPENDING PER PUPIL/STUDENT PER YEAR AT DIFFERENT STAGES OF EDUCATION, ACTUAL AND PLANS (2016-17 PRICES)**[34]



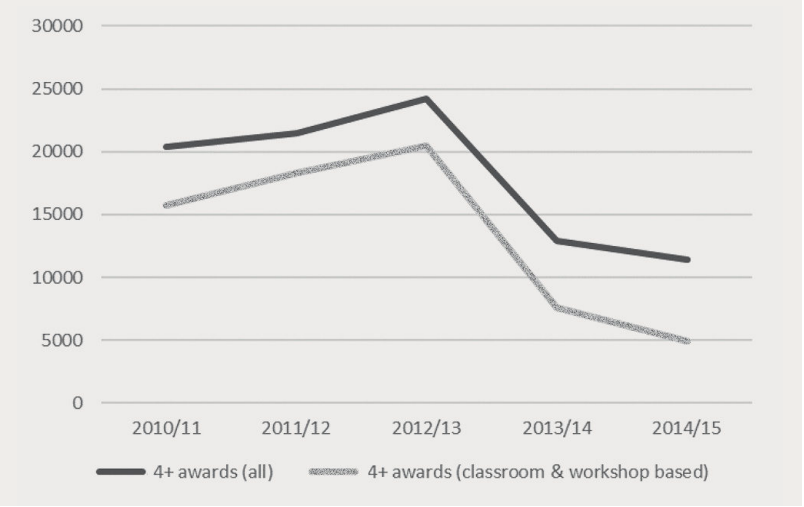
Source: Own elaboration.

It is in this lengthy process of decline that establishing Institutes of Technology aims to change. But given the degree of decline and the gravitational pull of policy and funding towards other full time further and higher education options, this looks particularly ambitious.

Furthermore, any attempts to build in additional functions relating to applied research will prove equally challenging as research and innovation funding has also tended to become more concentrated in universities (and particularly research intensive elite institutions such as those represented in the Russell Group). As shown by David Willetts (2017) and as Box 1 illustrates, this research concentration in traditional universities has been at the expense of both specialist applied research institutions and applied research as a whole.

[34] Belfield C, Crawford C, Sibieta L, Long-run comparisons of spending per pupil across different stages of education, Institute For Fiscal Studies, 2017.

Chart 5. **LEVEL 4+ COURSES SUPPORTED BY ADULT SKILLS BUDGET: ENGLAND 2011-15**[35]



Source: Own elaboration.

However, as Conservative manifesto plans suggest, one aspect of the important ambitions for Institutes of Technology is to incorporate applied research into the model. The experience of similar applied technical institutions in other countries shows the importance of such activity. It also suggests the consideration of models such as *Fraunhofer Institutes* in Germany and the links to the Catapult Centres developed in the UK on a similar template.

This was always a feature of Colleges of Advanced Technology in the 1950s and 1960s and Polytechnics in the 1970s and 1980s, though less obviously so in more recent models such as National Skills Academies (NSAs) or National Colleges. Note however, the requirement in the most recent tendering documents for Institutional bids.

«Institutes of Technology (IoTs) will develop their own research capability focused on applied research, working with employers to identify relevant funding streams and prepare for the workforce challenges of the future (e.g. industrial digitalisation, automated manufacturing). They will need to demonstrate ambition in using the applied research and innovation base to inform their curriculum and learning offer, for example through building links with centres of innovation such as Catapults».[36]

[35] Wolf A, with Domingues Reig, G and Sellen P, (2017), Remaking Tertiary Education, Education Policy Institute.

[36] Institutes of Technology Prospectus, DFE (2017) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/663691/DfE_IOT_Prospectus_Nov17.PDF

Like other countries and systems, there have been many different types of research and development institutions; this diversity of characteristics and missions is essential for a well-functioning national innovation, as well as skills, system. The balance between different types of institutions can vary over time and between different countries. Since the 1980s and as a result of specific policy changes, more applied research has been university-based - a position which is proportionately larger than in most other research-intensive countries.

Box 1. **A TYPOLOGY OF RESEARCH AND DEVELOPMENT INSTITUTIONS**

Research and Development takes place in different kinds of institutions, which differ in their missions and roles within an overall national innovation system. Some examples of these different types of institution include:

- **Universities**. Here research, often but not always basic in character, driven by disciplinary/academic priorities, is carried out, usually with support from research councils, in parallel with undergraduate and postgraduate teaching.
- **Publicly supported basic research institutes**. Research driven by disciplinary/academic priorities, largely government supported. E.g. Max Planck Institutes in Germany, the Francis Crick Institute (UK).
- **Public sector research establishments (Civil)**. Research directly supported by government driven by non-defence state priorities. E.g. Health and Safety Laboratory, Meteorological Office, National Institute for Standards and Technology (USA).
- **Public sector research establishments (Defence)**. Research directly supported by government in support of defence (though often with an aspiration to create marketable civil technologies as spin-offs). E.g. Los Alamos National Laboratory (USA), Defence Science and Technology Laboratory, Porton Down (UK).
- **Public sector translational research institutes**, with strong private sector partnerships. Government run laboratories with a primary mission to support innovation in the private sector. E.g. ITRI (Taiwan), Fraunhofer Institutes (Germany).
- **Private sector contract research organisations**. Private sector (including not-for-profit) laboratories dependent on R&D contracts from both the public and private sectors. E.g. SRI International (USA), Battelle Memorial Institute (USA).
- **Corporate research laboratories** carrying out strategic/long-ranged research. Laboratories supported by large companies carrying out long-ranged, speculative research. E.g. Bell Laboratories (pre 1996, USA), Google X Laboratory (USA).
- **Product focused company R&D laboratories**. Private sector R&D focused on existing or planned products and services, including both large companies and spin-outs.

'Laying the Foundations' – First Report of the Industrial Strategy Commission, June 2017.

If the UK is to increase its capacity to link R&D with its higher level technical training capacity, it will need to be conscious of the whole of this innovation landscape. It will be important to pay attention not just to individual institutions, but to the relationships between the different parts. This includes relationships between university research, business research, and technical institutions specialising in training.

This is the reality of the surrounding institutional frameworks within which Institutes of Technology must survive. It is a mix of culture, history and policy decisions that have constrained the growth of such institutions in the past.

Box 2. **A SHORT (AND UNHAPPY) HISTORY OF SPECIALIST TECHNICAL INSTITUTIONS IN ENGLAND**

Colleges of Advanced Technology – created in 1956 following publication of a Government White Paper on Technical Education. Originally under Local Government control, freed in 1962 and in 1966 awarded University Status after Robbins report (1963). Included Birmingham Cat (now Aston University), Loughborough, Northampton (now City University), Battersea CAT (now University of Surrey), Bristol CAT (now Bath University), Salford, Bradford.

Polytechnics

Many institutions created including as Mechanics Institutes and Art Colleges in the 18th and 19th centuries but formally made Polytechnics in 1965 (Crosland speech) Governed by CNAA – including Brighton, Bournemouth, Manchester, Sheffield, Leeds, Greenwich, Huddersfield, Hatfield, Liverpool, Middlesex, Portsmouth, Teesside, Bristol, Preston and Wolverhampton. In 1992, the Further and Higher Education Act enabled Polytechnics to become universities and none retained the name.

Centres of Vocational Excellence (CoVE) was a status given to departments in FE colleges and some private training providers in England. Intended as a quality guarantee for vocational teaching, it was awarded by the Learning and Skills Council between the years 2001 and 2007. At its peak, the scheme had designated over 400 Centres of Vocational Excellence.

National Skills Academies

Nineteen employer led colleges 'at apex of skills system' sponsored by Sector Skills Councils (New Labour initiative from 2001 onwards) were created in sectors including creative and cultural, construction, financial services, enterprise, manufacturing, logistics, IT, nuclear and food and drink.

National Colleges

Colleges for high-level, specialist skills in key sectors were created in 2014 under the Coalition Government. The centres of high-tech training were to ensure the UK has skilled people in industries crucial to economic growth – including in high speed rail, nuclear, onshore oil and gas, digital skills and the creative industries. In 2016 funding for five National Colleges was announced.

And yet, there are emerging new institutions that appear to be thriving in this policy space. The Advanced Manufacturing Research Centre in South Yorkshire and the Warwick Manufacturing Group in the West Midlands are two such examples. Both are supported by elite, research intensive universities – Sheffield and Warwick Universities. Both bring together high level technical training from school and college level to undergraduate and postgraduate studies. Both combine training with applied research and both rely heavily on the involvement of nearby employers –

operating locally and globally and including the likes of Jaguar Land Rover, Boeing, Rolls Royce and McLaren (See Box 3 below).

Box 3. **THE ADVANCED MANUFACTURING RESEARCH CENTRE (AMRC) IN SHEFFIELD AND THE WARWICK MANUFACTURING GROUP (WMG)**

The Advanced Manufacturing Research Centre (AMRC) in Sheffield provides a relevant prototype for Institutes of Technology. Bringing together a series of initiatives and funding streams including Catapult Centres, Research Partnership Investment Funding, Apprenticeships and University Research the AMRC also includes funding and facilities operated by Boeing, McLaren and Rolls Royce. Led by Sheffield University in partnership with these employers and with Sheffield City Region LEP and Sheffield City Council, the site houses a growing cluster of facilities for training, production and applied research and development in various high value manufacturing sectors.

The aim throughout has been to develop open R&D facilities with a strong focus on translation, with very strong links both to the research base and to companies large and small, but also on developing skills in a way that joined up the landscape from apprentice-level technical training of the highest quality, through degree and higher degree level education in technology and management.

The Warwick Manufacturing Group is an academic department of the University of Warwick, employing over 600 staff including industrial secondees and working across seven research and education centres on the Warwick campus, with three more under development.

Founded in 1980, its mission has been to improve the competitiveness of organisations through the application of value adding innovation, new technologies and skills deployment with a current annual budget of £200m (industrial and in-kind support). It has over 2000 students, including on degree, postgraduate and apprenticeship programme and has expanded into for the energy, connected and autonomous vehicles, and cyber security sectors.

See www.amrc.co.uk and www.warwickmanufacturinggroup.ac.uk for further details.

5. CONCLUSIONS

«*We live in a highly competitive world in which the accent is more and more on professional and technical expertise. We shall not survive in this world if we in Britain alone downgrade the non-university professional and technical sector. No other country in the Western World does so.... This demand cannot be fully met by universities. It must be fully met if we are to progress as a nation in the modern technological world. In our view it therefore requires a separate sector with a separate tradition and outlook within the higher education system*».

These are not Theresa May's words, but those of the Labour Education Secretary Tony Crosland in 1965, when launching the policy decision to create polytech-

nics in response to the Robbins Report[37]. But they could so easily have been replicated over fifty years later in the Conservative manifesto of 2017 or in her speech launching the «major review of tertiary education».

Curiously the idea for Institutes of Technology predates the Industrial Strategy. The Skills Plan, responding to Lord Sainsbury's Review was published in July 2016 in the final days of David Cameron's government and Institutes of Technology, were first announced in George Osborne's 2015 Productivity Plan. There were no plans for a broader industrial strategy at either time. Both initiatives first surfaced before a new Department for Business and Industrial Strategy was created in Theresa May's reshuffle of departments later in the same month. Now they are, neither the timetables nor the resources look transformative. So far only £170m capital funding has been made available for Institutes of Technology but over two years after their initial announcement, there is no timetable for their introduction and no detailed plan for what they will do.

The Government's job this time, if they are to get an Industrial Strategy right, is to ensure that Institutes of Technology are properly linked to other policies around them. They must also be more flexible and adaptable according to «place». At the moment they are neither. A «one size fits all» approach is unlikely to work. Sheffield's Advanced Manufacturing Research Centre provides a blueprint for change with employer investment (Boeing, Rolls Royce and McClaren), applied research and a thriving apprenticeship programme. It is linked to a leading university - Sheffield - and specialises in a sector key to both the local and national economy.

As the Industrial Strategy Commission's interim report said, the UK (and England in particular) has a poor record in workforce skills. This is true in both the levels of skills amongst its workforce and in the many, usually short lived, policies designed to remedy them. Tellingly, the Institute for Government's investigation into policy «turbulence» – «All Change» also uses, devolution and industrial policy, together with skills, as its three egregious examples of poor policymaking in government. All three come together in the chequered history of technical education reform. One aspect of that poor track record comes down to the constant chopping and changing of policies and institutions as new solutions to ensuring problems are sought.

«Place» and longstanding regional inequalities are also significant. These are also key themes of the Government's Industrial Strategy and new specialist institutions must have regard to them. As the evolving institutions in Sheffield and Warwick demonstrate, it is both possible and desirable for them to help drive regional growth in key sectors.

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[37] Crosland speech, Woolwich Polytechnic (now Greenwich University 1965. See http://www.hepi.ac.uk/2016/08/15/polytechnics-or-universities/ for full text of the speech.

But perhaps above all, any institutional reforms must be allowed both time and sufficient resources to succeed. That should be a first principle in this policy area. A second should seek better integration with other policy interventions in the Industrial Strategy. Too often skills policy has created a freestanding system with few connections to important parallel interventions, including science and research, investment and place. Skills policy must be more holistic and better integrated into a new industrial strategy as well as better connected to particular industry needs.

More thought must also be given to the vertical relationships between the higher education sector and the further education sector as well as to horizontal links to research and innovation. Current and historical policy frameworks too easily force these sectors and incentives into competition or conflict, and rarely into working together.

But finally and perhaps most importantly is that historic policy failure has not just been because of short termism, continual chopping and changing of policy or bad institutional design. Too often the roll call of technical institutions – from Polytechnics to National Colleges have been small in scale or have had inadequate resources relative to other routes. There has been a lack of «systemic» thinking and stronger more established routes and institutions – most often universities – have typically been better resourced, more prestigious and first in the queue for research spending.

If Institutes of Technology are to stand any chance of long term success, their relationship to other more established parts of the tertiary system must be fully considered. The Government's announcement of a «Major Tertiary Review» at least signals the intention to look at specialist technical institutions in the context of the wider FE and HE systems. Time will tell whether these intentions are enough.

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