



ASSOCIATION
OF COLLEGES

**Sheffield
City Region**

SHEFFIELD CITY REGION STEM LEVEL 3+ CURRICULUM REVIEW

DECEMBER 2017

EXECUTIVE SUMMARY

- The Sheffield region Strategic Economic Plan 2014 (SEP) ambition to create ‘30,000 jobs in highly skilled occupations’, as a proportion of 70,000 new jobs target by 2020, is highly dependent upon the need to ensure an increase in the number of the adult resident population that have the technical talent and higher skills to meet economic demand for a next generation of higher-value STEM skills.
- Analysis of the SCR’s EMSI data shows that across the SCR’s 21 Priority Occupations associated with higher skilled STEM in the SCR area, the total number of jobs in those occupations is projected to increase from 55,442 in 2015 to 57,832 in 2022, a rise of 2,390 jobs¹. This represents 8% of the SCR overall target.
- However, replacement demand for employment (accounting for those retiring or leaving the workforce) is substantially higher than total new jobs growth across the SCR. 8,800 replacement jobs are forecast across the 21 priority STEM higher skilled occupations over the same timeframe representing almost four times the level of new job creation in the SCR.
- Taken together (11,190 jobs) the new jobs and replacement forecast in STEM industries represent 37% of the 30,000 higher skilled occupations requiring level 3/4 and above relevant qualifications and/or higher apprenticeships
- In addition to the overall jobs forecast number; we believe, the evidence base for the total projected job forecast in the higher skills STEM jobs could be much greater if we take into account the future impacts of inward investment. This is currently taking place through SCR Growth Deal funding in higher-value STEM manufacturing, related areas of innovation and research and transport and logistics infrastructure investment.
- The economic and political environment surrounding Brexit, and Government skills policy directions, could impact positively on jobs forecasts - with a potential softening on Brexit, the emphasis on jobs and growth, and a potential reinvigoration of investment in priority adult skills, particularly as a mechanism to tackle the UK’s significant workforce productivity challenge, and as part of a national requirement to retrain the workforce to meet replacement demand could further increase the projected job forecast - though it is hard to see how this latter need will be met within the existing policy framework.
- In 2015/16 there were 46,480 post 16 learners who live in the SCR area registered on courses offered by in-scope providers. Of these 11,250 learners were studying core and related STEM Level 3+ qualifications of which 58% (6,570 learners) were undertaking 16-19 Study programmes weighted towards a-Levels and 42% were Adult Learners. In respect of HE there were 33,180 learners studying relevant or core HE qualifications.
- Findings from the analysis and mapping of STEM Level 3 qualifications and occupations has highlighted:

Occupations

- Based on pure numbers and at top level there is currently sufficient supply to meet demand in most occupations but not all.
- There are key areas which should be given priority in respect of supply prioritisation and development due to either a current relative low supply in current provision or where there are significant current and future job opportunities. These are:

¹ SCR EMSI projections 2016’

- Programmers and Software Development Professionals; and IT Operations Technicians
- Engineering Technicians; Metal Working Production and Maintenance Fitters
- Vehicle Technicians, Mechanics and Electricians
- Electricians and Electrical Fitters

Level of Qualification

- The majority of Level 4+ qualifications in core or related STEM subjects are delivered by HEIs, with a small provision in General Further Education Colleges.
- In respect of Apprenticeships only 8% are linked to higher level apprenticeships
- A significant number of learners studying at level 3 already possess a qualification at this level indicating that there is a degree of retraining taking place or reflecting the fact that these learners are studying programmes to access HE.
- There is clearly a 'gap' or blockage in the system for the older workforce already in employment studying for a higher level qualification. This is driven substantially by Government Policy. There is a risk if this continues that the older workforce will start to become deskilled as the jobs market demands higher levels of attainment. This will place an additional strain on replacement demand.

16-18 Provision

- Learner numbers have shown an increase in both vocational (+9%) and A-Level (+12%) in STEM related subjects since 2013/14
- There has been a noticeable reduction in IT related provision and vehicle trades.
- There is insufficient provision in class room based craft related courses to meet projected demand for example in welding, carpenters and joiners, vehicle technicians and electricians and electrical fitters
- A significant proportion of the provision is for A-levels where the likely progression route is to HE, therefore career choices cannot be predicted until the degree choice has been made, if then.

Adults

- With the introduction of Advanced Learner Loans for adults over 24, there has been a significant decline both adult provision generally and in the number of adults studying in priority STEM areas since 2013/14
- The few learners taking up such loans are mainly women studying access programmes in Health related programmes i.e. outside the scope of this review
- There is evidence of older learners studying for degrees and taking up apprenticeships and therefore this is likely to indicate individuals seeking retraining or upskilling. Other than this there is clear evidence that the loans regime has limited opportunities for older workers. We were not able to establish within the scope of this review to what extent in-company training or commercial course are filling the apparent gap.

- A significant number of adults taking loans already have a level 3 qualification, with some having prior attainment at Level 1. This indicates that there is a degree of retraining taking place including access to higher education qualifications.
- The majority of Colleges consulted did not use the opportunities provided by the Skills Bank which could be a useful tool to address some of these problems. We understand that there is better take up of this provision by private providers. There is an opportunity to explore the barriers, real or perceived, which prevents Colleges accessing this provision.
- We are aware that the most recent Post 16 Skills Plan states that this is an area to be addressed but, at the time of writing, the retraining of older workers is a major area of concern.

Apprenticeships

- The majority of apprenticeship provision continues to be at Level 2 (58%)
- Of the 16,520 Advanced and Higher Apprenticeships delivered in the SCR 49% and 41% respectively were delivered in STEM related subjects
- The analysis has shown that there is a high take up of apprenticeships in the following occupations:
 - Electrical trades
 - Metal working trades
 - Engineering Trades

And a low take up in

- Lab Technicians
- Carpentry and Joinery
- IT related areas
- The majority of apprenticeships delivered by in-scope providers at advanced and higher level are in health-related areas and not the areas in scope
- Only 8% of apprentices are Higher Level
- 79% of apprenticeships are delivered to adults (i.e. over 19)
- The majority of provision for SCR residents is delivered by Private Training Providers
- The higher skills occupations are underrepresented in terms of current numbers of higher apprenticeships

Resources

People

Whilst staff recruitment and retention are primarily the responsibility of individual organisations, the current challenges in recruiting lecturers in construction, engineering and maths are already common across the network and only likely to increase with the demand for more specialist/higher level skills. Given these difficulties, there was a suggestion that this was an area where there could be sharing of resources, including joint approaches to CPD, or trialling new forms of contract.

Specialist Facilities

Those interviewed suggested that they had no major plans for capital development in the current environment

Colleges and other providers are generally operating within a short-term annual planning horizon. With the financial and policy uncertainty facing the sector, there is a potentially key role for the SCR working in partnership with colleges to underpin capital investment to enable colleges to meet the key skill needs of the local economy. We would identify the following as potential priority areas for discussion with the Colleges and Providers based on a combination of the findings in this report and the fact that these are the most capital intensive areas of the curriculum.

- Engineering Professionals, Technical support and related occupations
- Metal Trades including machine setters, setter operators, metal working production
- Electricians and electrical and electronic trades
- IT systems support
- IT and Lab Technicians
- Construction including Joinery
- Vehicle Technicians mechanics and electricians

Planning

All the colleges and providers had planning processes in place and all used LMI to varying degrees and in various ways to inform the process. There was a view that robust LMI was a key requirement but this was sourced on an individual, ad hoc basis. We believe there is a clear role for the SCR in producing robust and accessible data both to ensure its accuracy/consistency and to aid those smaller organisations which may not have the resource to access and/or interpret the information currently available.

This information should then, in turn, support the successful implementation of the CEIAG Strategy currently under consideration.

Given the strategic importance of the Colleges and the main private providers to the locality there is clearly considerable mutual benefit value, as is clear from this review, in a regular strategic dialogue between the SCR and the colleges/main providers considering the institutions strategic plans, finance, quality and capital proposals.

HEIs also have a vital role to play both in meeting the higher-level skills that the region requires but also in informing the planning of the Sixth Form Colleges and schools. In the context of this review, there is a need to explore the potential for establishing much more coherent system of progression routes between the college network and key HEIs. We also believe that the intelligence that the HEIs have access to would be a valuable asset to all providers and therefore the opportunity to share this data should be developed further.

Quality

We did not undertake a detailed review of the quality of provision as part of this review except as detailed elsewhere in the report. The majority of the core providers were classified as Good or better at their last inspection with two graded as Requires Improvement (one of which is no longer trading).

There are areas that require further exploration including overall performance in Engineering and Manufacturing for apprenticeships. The majority of providers but not all are operating above the national average benchmark. Again, this is an area where detailed examination would have to be done on the core qualifications and individual providers if the Ofsted Grade is not to be taken as a proxy. This aspect would be dealt with as part of the Review/Strategic Conversation if this recommendation was adopted.

Employer Engagement

All of the Colleges interviewed had developed links with local employers and some with regional and national employers. These links variously informed curriculum development, planning and the learner experience. Generally, those with stronger apprenticeship provision had the greater interaction.

Careers

As stated in the Post 16 Skills Plan and the Sainsbury Review, effective career guidance is key to ensuring that individuals can make effective choices as to career routes and the most effective pathways to them. The SCR has reviewed its strategy in this area and has developed a plan to respond to what has become a fractured and less effective system.

We would endorse this approach. We also believe that a core element of this Strategy is the development of robust and readily accessible LMI for the region which Colleges, providers and schools could use as the basis for planning as well as learner guidance.

Review Outputs

In addition to the analysis of supply and demand at a regional level described in outline above and in detail in the report, the study has produced a range of practical planning tools for use by providers and by the SCR to review delivery and match provision to opportunities. These tools are as follows:

- Priority STEM Occupation Review Tool
- Apprenticeship Curriculum Planning Tool
- The Overall SCR and College Gap Analysis Template
- Apprenticeship Forecasting Tool
- STEM Planning and Forecasting Tool

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1.0 Introduction

1.1 Background

The AoC Create team was engaged in January 2017 to carry out a pilot review of STEM level 3 qualifications for the Sheffield City Region (SCR). The review team consisted of the following people:

Peter Ryder	-	Project Lead
Richard Boniface	-	RCU Data Analysis
Richard Bell	-	Research and Development
Simon Tanner	-	Research and Development
Nicola Tomlinson	-	Project Management

The team was further supported by:

Julian Gravatt	-	Deputy Chief Executive (Policy, Curriculum and Planning) AoC
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1.2 The Brief

One of the key recommendations of the ABR in 2016 was:

“The Combined Authority/LEP to commission full curriculum mapping of all post 16 education in the Sheffield City Region, building on the work already undertaken through this review, to inform their future skills commissioning and investments”

As a comprehensive region wide review was seen as both complex and lengthy, a pilot review looking at STEM related technical qualification at level 3 and above in regional priority areas was commissioned by the SCR. This was seen to have a number of benefits:

- Developing a blueprint for subsequent reviews
- Understand curriculum delivery pertinent to key growth occupations/industries in the SCR
- Focus on driving manageable change
- Prepare for longer term reform within FE through implementation of the Sainsbury Review of the governments Post-16 Skills Plan
- Support activity of the proposed Apprenticeship Company which will focus on Apprenticeship provision at Level 3 and above.

The SCR brief was in three phases as follows:

Phase 1

Provide a detailed Occupational Overview for each occupation/group of STEM occupations, which considers

- The industries it fits across
- Proposed changes/developments in that industry/sector
- Impact of external factors on that industry/sector i.e. disruptive technology
- Geographical variances

Identify appropriate qualification groupings for each priority occupation (or group of occupations).

Phase 2

- Identify which providers in SCR are in scope for the review
- Map delivery of qualification groupings from in scope providers,
- Conduct interviews with in scope providers to assess (but not limited to) the following
 - Facilities and equipment
 - Delivery (data/quality)
 - Staffing (expertise and availability)
 - Employer engagement/relationships
 - Careers
 - Curriculum Planning
- Work with a representative sample of wider stakeholders to understand their role/connection with delivery, i.e. schools, CIAG providers, employer bodies

Phase 3

Develop a Recommendations Report and associated Action Plan

Output

The outcome of this piece of work is to drive collaboration and a strategic skills and infrastructure investment strategy for the region to ensure a skilled labour force to meet the demands for job growth and replacement.

The core outputs of this commission includes the following:

- A final report with executive summary, technical appendices that include the detailed methodology used, results from all research and a clear set of recommendations
- Occupational Overviews and clearly mapped provision
- An Action Plan agreed by the Curriculum Review Steering Group
- Series of tools to be used by the wider LEP community for future reviews
- Update reports for the SCR ABR Implementation Steering Group and Funders
- Presentation to the ABR Implementation Steering Group and Skills, Employment and Education Executive Board
- Final evaluation report – for external funders

1.3 Approach

The team used a variety of methods to produce this report including

- Review of LMI data and forward plans for the City Region
- Review of EMSI data and relevant national data as it pertains to the industries and occupations under review
- Extrapolation of demand data for skills and cross matching exercise against provision amongst providers in scope
- Development and testing of key planning tools including where possible testing beta versions with an in-scope provider
- Analysis of key national policies
- Analysis and coding of ILR data to map provision across the region and to identify key providers related to the delivery of STEM in FE
- Interviews with key providers and stakeholders
- Testing of the developed Curriculum Planning Tools with a number of Colleges
- Review of the tools with the Principals of the in-scope Providers

1.4 Acknowledgements

Principals, Head teachers, Managers and senior staff have been extremely helpful during the course of our work and we have been received with unfailing courtesy and patience. We are grateful to everyone who has helped us for their support in producing this report

2.0 Methodology

2.1 Development of the Curriculum Review and Planning Tools

2.1.1 Defining STEM

As there is a lack of a single definition of STEM and its constituent parts, the first task for the project team was to agree a working definition of 'STEM'.

A, 2011 Department of Business, Innovation and Skills Report on STEM Graduates in Non-STEM jobs² offered a very useful approach which we used to help classify STEM, and map the SCR priority occupations across SOCs 21, 31, 52, and 53 (see **Appendix 1**) that accompanies this report for full details of the priority occupations drawn from the Standard Occupational Classifications with STEM qualifications through FE, WBL, and HE.

The BIS (2011) STEM definition started with subject classifications in the HE sector that are derived from the Joint Academic Coding System (JACS)³ identified by the Higher Education Statistics Agency (HESA). This was used to identify the following codes which are taken to represent STEM courses in HE. These are:

- B) Subjects Allied to Medicine
- C) Biological Sciences
- D) Agriculture and Related Subjects
- F) Physical Sciences
- G) Mathematical Sciences G) Computer Sciences
- H, J) Engineering and Technology
- K) Architecture, Building and Planning

The report highlighted how students studying these broad subjects would be considered to be STEM graduates, highlighted that some subject areas had been excluded, whilst some further additions had been made. Those removed include areas considered to be in "very vocational subjects" including Medicine and Dentistry, Veterinary Science and Nursing because graduates in these areas usually make a direct move into STEM jobs.

Students of Psychology, Geography and Archaeological/Forensic Sciences were added to reflect a wider appreciation of a spectrum of more, or less, scientific courses, although this may be less relevant to the needs of key industries in the SCR area.

It was also possible to identify comparable subject classifications in the FE sector. The FE sector uses a system of subject classification built around two levels of classification: the sector subject area and the learning aim. 'Subject Sector Area work in a similar way to the JACS code system used in HE by identifying two tiers of subject classification. All FE institutions are obliged to record this element for all students studying at their institution via the Individual Learner Record (ILR).

² See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32379/11-771-stem-graduates-in-non-stem-jobs.pdf for a copy of the report.

³ JACS has been in operation since 2002/03 and classifies courses and the individual modules within them using a three tier system of classification.

The latest version of the Sector Subject Areas (2012) illustrates the following Tier 2 SSAs that would correspond with the JACs listed above as follows:

- 1 Health, Public Services and Care (Not Classified into SSA T2)
 - 1.1 Medicine and Dentistry
 - 1.2 Nursing and Subjects and Vocations Allied to Medicine
 - 1.3 Health and Social Care
- 2.1 Science
- 2.2 Mathematics and Statistics
- 3 Agriculture, Horticulture, and Animal Care (Not Classified into SSA T2)
 - 3.1 Agriculture
 - 3.2 Horticulture and Forestry
 - 3.3 Animal Care and Veterinary Science
 - 3.4 Environmental Conservation
- 4 Engineering and Manufacturing Technologies
 - 4.1 Engineering
 - 4.2 Manufacturing Technologies
 - 4.3 Transportation operations and maintenance
- 5.1 Architecture
- 5.2 Building and Construction
- 6 Information and Communication Technology
 - 6.1 ICT Practitioners
 - 6.2 ICT for Users
- 9.3 Media and Communication
- 9.4 Publishing and Information Services
- 10.2 Archaeology and Archaeological Sciences
- 11.1 Geography
- 11.2a Psychology

Whilst the SSAs provided a broad mechanism to capture STEM qualifications, the emergence of new technologies means that there may be STEM elements that feature in SSAs outside of those above, particularly those related to 9.3 Media and Communications (Audio Visual and Multi-Media Techniques) and 9.4 Publishing and Information Services.

From the teams' previous experience of work for Creative Skillset (the Sector Skills council for the Creative and Media Industries)⁴ this broad way of classifying qualifications did not provide the 'granularity' of definition that the specifics of STEM, or the nature of industrial sectors and the occupational roles fulfilled within them, required to fully capture the relevance, or not, of the qualifications these broad categorisations cover. Therefore, it was necessary to review individual learning aims (FE) and courses (HE) to assess whether they should be included in the overall categorisation as STEM, or excluded.

The 2011 BIS report provided a mechanism to support this approach as it focused upon defining employment sectors, AND, occupations as STEM, and it identifies a matrix approach to address this based on three tiers for industry and three for occupations.

For industries, the three tiers cover:

- STEM Specialist where a STEM specialism is a requirement for employment in that sector.

⁴ S.Tanner (2012) 'Mapping Creative Skillset Relevant Education and Training Provision in FE and HE in the UK' Creative Skillset, London.

- STEM Generalist where a STEM specialism seen to provide a range of skills or knowledge that are an advantage for the jobs in that sector.
- Non-STEM – have no specific demand for STEM subjects, but may still recruit STEM graduates.

For occupations (as addressed in this STEM Curriculum Review), the three tiers cover:

- STEM Core jobs, where STEM disciplines were closely related to the type of work performed in that role;
- STEM-related jobs, where some STEM disciplines relate more loosely to the type of work performed in that role;
- Unrelated.

In the qualification classification work, we adopted a similar classification approach relating each qualification/course to each priority occupation against the following three tier approach that draws on both approaches for industries and occupations outlined above. Thus we classified each qualification/course to each priority occupation against the following three tiers:

- CORE to Occupation – qualification/course is a key component of the role.
- RELATED to Occupation – qualification/course is generally related to the role.
- UNRELATED

To illustrate how this has been applied the **tools** overleaf illustrate how we worked with the definitions of the priority occupation and the STEM definition above to identify the full scope and scale of STEM delivery in the SCR area.

Thus STEM qualifications are allocated to specific occupations if they are CORE to that occupation, or if they are RELATED.

Figure 1 overleaf shows the Qualification Matching Tool that has been used for this STEM Curriculum review work, whilst **Figure 2** shows the rationale that has underpinned its use. It is intended that these tools will be able to be used for future Curriculum Review work by SCR.

These tools have been used to produce the course lists – core and related can be found in Appendix 1A

Figure 1: Qualification Matching Tool

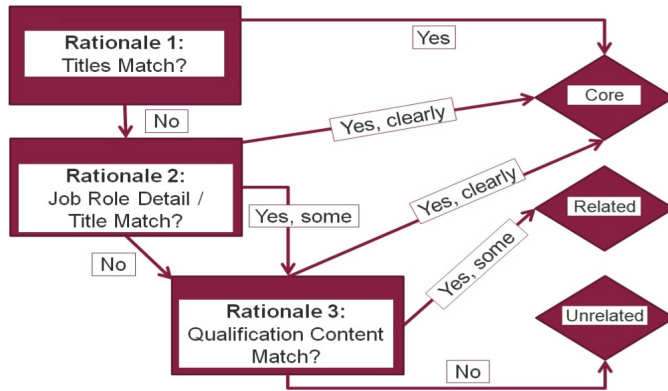


Figure 2: Rationale for Qualification Matching

Rationale	Question	Classification
Qualification Title (1)	Does content of title match specific job role – e.g. engineering, plumbing, IT Manager?	Yes = Core; No = Consider Rationale 2
Detail of Occupation/Industry from Official Classification (SIC/SOC) (2)	Do job role, or suggested job titles match/are similar to title of qualification	Yes clearly = Core Yes some/similar = Related, check rationale 3; No = Consider Rationale 3
Qualification content details from OfQual Qualification Register	Do broad details of qualification match key elements of job role or job title	Yes clearly = Core; Yes, some = Related; No= Unrelated

2.2 Analysis methodology

2.2.1 RCU Analysis of Data

RCU has been providing research and consultancy related to education and training since 1987 and has a national reputation for excellence in data analysis and intelligence.

RCU were commissioned as part of the project to carry out the curriculum mapping tasks required of the project. The datasets that were analysed were:

- National Individualised Learner Record (ILR) 2015/16
- HESA data (2014/15)

These data sets provided details of qualification aims, learner volumes, learner characteristics and providers. Provision was analysed by a range of variable including Level of Study, delivery location, subject area, funding course, learner characteristics and qualification type.

The definition of 'HE provision' as used within this report covers learners undertaking foundation degree, undergraduate, and postgraduate studies at Higher Education Institutions funded by the Higher Education Funding Council for England (HEFCE). It also includes learners at learning providers (including Further Education Colleges) that are directly funded by HEFCE and those that deliver higher education through a sub-contractual arrangement. These learners are registered on undergraduate courses other than first (undergraduate) degrees, such as foundation degrees, HNDs and HNCs.

The following task were undertaken as part of the data analysis:

1. Mapping of occupational priorities to qualifications and qualification groupings
2. Identifying which providers are in-scope for the review
3. Map delivery of qualification grouping for in-scope providers

2.2.2 Identifying the in-scope providers

In scope providers were identified based on the volume of delivery according to the ILR and equivalent HE data. This confirmed that the majority of provision, at least for aspects other than apprenticeships, was through the HEIs and the General FE and Sixth Form Colleges in the SCR. We also identified private providers that were delivering significant volumes of apprenticeship frameworks.

Detail on the providers that were in-scope are as follows:

College	Total College income	Information on the college
RNN Group	£50m	<p>With an income of circa £50m each year, the RNN Group includes Rotherham, North Notts and Dearne Valley Colleges of further and higher education, and five training organisations.</p> <p>It offers technical education for 16-18s and adults, apprenticeships and higher education provision, community education and ESOL. It trains over 15,000 learners each year, including over 4,000 apprenticeships of which it is one of the</p>

		largest providers in the SCR.
Barnsley College	£41.7m	Offers a wide range of technical education and academic qualifications in most sector subject areas to 16-18 years olds and adults as well as HE and apprenticeships
Chesterfield College	£40.4m	Offers a wide range of technical education and academic qualifications in most sector subject areas to 16-18 years olds and adults as well as HE and apprenticeships
Doncaster College	£30.69m	Technical education curriculum and apprenticeship offer only adults as well as HE and apprenticeships
Rotherham College	£24.23m	Part of the RNN Group. Full range of curriculum provision and apprenticeships are offered as well as HE and apprenticeships
Sheffield College	£54.2m	Offers a wide range of technical education and academic qualifications in most sector subject areas to 16-18 years olds and adults as well as HE and apprenticeships
Thomas Rotherham Sixth Form College	£6.9m	Sixth form curriculum offer and a growing technical education offer. It considers itself a specialist in Advanced Maths. The college delivers small volumes of apprenticeships
Longley Park SFC	£6.36m	Offers provision in 11 sector subject areas. The A-Level offer is relatively narrow and most students undertake technical qualifications. NO apprenticeship programmes are offered.
Sheffield Hallam University	£226.5m	The eight largest University in the UK with over 30,000 students
University of Sheffield (AMRC)	£50m	The University of Sheffield Advanced Manufacturing Research Centre with Boeing. It specialises in carrying out world leading research into advanced machining, manufacturing and materials which is of practical use to industry
GP Strategies Training Ltd	£18.8m	A UK based subsidiary of GP Strategies Corporation of America offering local and national training solution and services for both government and commercial organisations
CITB – Construction Skills	£12.1m	A national company working with the industry to deliver a safe, professional and fully qualified UK Construction workforce
JTL	£7.8m	One of the top three work based learning providers in England and Wales offering Advanced Apprenticeships and NVQ Assessments within the building services, engineering sector

2.2.3 Selecting the Occupations

The 21 priority occupations were identified by the Sheffield City Region based on EMSI data.

2.2.4 The 21 Priority Occupations

The following occupations were used as part of this review:

- 2129 Engineering Professionals nec
- 2133 IT Specialist Managers
- 2136 Programmers and Software Development Professionals
- 2139 IT and Telecomms Professionals nec
- 3111 Laboratory Technicians
- 3113 Engineering Technicians
- 3119 Science, Engineering and Production Technicians nec
- 3122 Draughts persons

- 3131 IT Operations Technicians
- 3132 IT User Support Technicians
- 5215 Welding Trades
- 5221 Metal Machining Setters and Setter Operators
- 5223 Metal Working Production and Maintenance Fitters
- 5231 Vehicle Technicians, Mechanics and Electricians
- 5241 Electricians and Electrical Fitters
- 5249 Electrical and Electronic Trades nec
- 5250 Skilled Metal, Electrical and Electronic Trades Supervisors
- 5314 Plumbers and Heating and Ventilating Engineers
- 5315 Carpenters and Joiners
- 5319 Construction and Building Trades nec
- 5330 Construction and Building Trades Supervisors

2.2.5 Testing of Curriculum Planning Tools

The team met with a representative of one of the in-scope providers at an early point of the process to explain the methodology and the results for their institution. We subsequently held a workshop with a number of senior curriculum staff to share the broader tools with the objective of testing their accuracy and their value in a real-world application. The results were incorporated into the versions which are attached as appendices to the final report.

2.3 Stakeholder Interviews

The review also included discussions with a range of stakeholders to assess a range of issues including planning mechanisms, the use of LMI, changes to expected delivery in the areas under review, potential for structural solutions to SCR challenges (but not seeking to repeat the work of the Area Based Review), specialisms and specialist resources both people and facilities.

The review included both Sixth Form Colleges as well as the key GFEs within scope, a private provider, the CITB and the ETF which was carrying out a parallel exercise though on a different topic and schools. The table below details the Stakeholders that were formally interviewed.

Colleges	Schools
Doncaster College Chesterfield College Barnsley College Rotherham College Sheffield College	Ecgbirth School Tapton High School Brookfield Community High School
Sixth Forms	Others
Thomas Rotherham Sixth Form College Longley Park Sixth Form College	ETF CITB AMRC Careers Consultant for SCR

The review team was unfortunately unable to arrange an interview with the UTC

Section 7 details the findings from the interviews with the in-scope Providers.

3.0 The Policy Environment

3.1 Introduction

To set the scene for the findings from this project this section starts with the national and regional context of the SCR before moving on to detail some of the key demographics, characteristics and employment statistics of the Sheffield City Region (SCR) relating specifically to higher level STEM.

3.2 National Context

Skills policy has a higher priority in national politics than ever, but within a context where the UK government is grappling with the very big issues associated with Brexit, the plan to leave the European Union by March 2019. This has resulted in delays and sidelining of major decisions on domestic policy while the Cabinet tackles big constitutional issues. The decision to call a snap election in spring 2017 and the result, in which the Conservative party lost their overall majority and had to reach a confidence and supply arrangement to stay in power, has created further confusion on big issues. Everyone in the government from the Prime Minister downwards says that skills, apprenticeships and technical education are priorities but what this means when it comes to an issue like skills devolution is less clear. The Government remains committed to the devolution deals agreed before June 2016 between ministers and combined authorities. DFE officials wrote to combined authority representatives in April 2017 with planning information. But whether government will be able to fulfil its side of the bargain in terms of securing Parliamentary approval for the readiness conditions and what will actually be involved in terms of funding agreements for 2018-19 remains to be seen.

3.2.1 Brexit¹

Between now and March 2019, the UK government will be engaged in detailed negotiations on a wide range of topics to secure the objective of an orderly UK exit from the European Union and a deal covering the future relationship. The lack of time available means it is possible there will be transitional arrangements. The UK/EU negotiations are likely to continue for some time yet and it is impossible at this point to predict the implications for the education and skills system but we do know some things. Ministers will be taking the UK to a new position in Europe and the world at a time when there are obvious weaknesses in the skills and productivity performance.

The long-standing skills issue is summarised in the fact that UK workforce productivity is 20-30% below the level in France, Germany and the USA. There are different theories as to why this is so, but there is widespread concern that the education system seems to work well for some young people but leave a large number entering the workforce with insufficient skills for future work, or progression in future jobs. The way in which people are managed and businesses led in the UK may also be a problem. Many UK-based companies compete well internationally, but there is research showing that horizons are too short, investment too low, and training insufficient.

The UK economy has been successful in recent years at job creation and unemployment is now at a forty-year low, but one aspect of this is a reliance on migrant workers from other EU countries which is likely to be affected greatly by any arrangements arising out of a future

¹ Key source: article by Richard Doughty on AoC website September 2016.

Brexit deal. Furthermore, the targets that the government has to reduce net migration could make this more difficult and will raise further questions about the way in which the education and skills system ensures that people have the right skills and about the way in which employers train and make use of the skills at their disposal. This is the context within which senior politicians have placed great hope in the recently implemented apprenticeship levy and planned technical education reforms. The consequence for colleges and combined authorities is an expectation that all 'actors' at a local, city and regional level will be thinking and talking about local economic need and making plans to respond to it.

3.2.2 The Post-16 Skills Plan

The Government published its post-16 skills plan in July 2016 at a time when the referendum had resulted in a change of Prime Minister, education secretary, skills minister and departmental structures. Nevertheless, the plan remains government policy. This was recently reaffirmed by a letter from the latest person to be appointed skills minister – Anne Milton – to stakeholders in July 2017. The post-16 Skills Plan was derived from a report commissioned from Lord Sainsbury who chaired a panel of experts and recommends streamlining the system by creating a common framework of 15 routes across all technical education. The routes will group occupations together to reflect where there are shared education and training requirements.

The idea is that only high-quality technical qualifications which match employer-set standards will be on offer to young people and that these new qualifications (now known as T Levels) will be put in place between now and 2022. A new, employer-led Institute for Apprenticeships (IFA) will regulate quality across Apprenticeships and its remit will be expanded to cover all technical education. Routes will begin with high-quality, two-year, college-based programmes, aligned to Apprenticeships. There will be only one approved tech level qualification for each occupation or cluster of occupations (which could also be used within the relevant Apprenticeship), though the exact way in which individual qualifications will fit within routes remains to be seen. IFA started work in 2017 and has a major task in getting T levels in place on a pilot basis by 2020 in anticipation of full implementation by 2022.

The Government's priority for the technical reforms was restated in two documents published in Spring 2017. The industrial strategy green paper emphasised the importance of the reforms, while the Spring 2017 budget earmarked a significant increase in funding to deliver them though with the expectation that T-levels will involve 50% longer learning than currently, equaling 900 hours of teaching per year.

The immediate priority for the technical education reforms is to change and improve education at Level 2 and 3 for young people aged 16 to 19, but there is a plan to extend the routes to the highest skills levels. As part of this, there will be a register of technical qualifications at Levels 4 and 5 which meet national standards and are therefore eligible for public subsidy through government-backed student loans.

3.2.3 Apprenticeship standards

Apprenticeships have been a priority for government for several years with a major reform effort starting in the late 2000s under the Labour government. This reform involved targets to increase the number of apprentices in training, a National Apprenticeship Service to engage employers and legal control over apprenticeship programmes which was enacted via the 2009 Apprenticeships Skills Children and Learners Act. The Coalition government made many changes to apprenticeship policy but it started a major process to reform programmes via the Richard review, which was published in 2012. This review set out a clear vision for a system

that is more rigorous and more responsive to employers' needs. In response, in 2013 the Government published plans to develop new Apprenticeship standards by launching employer-led trailblazers in a range of sectors and defined core principles of quality for any government-funded Apprenticeship, in particular that an Apprenticeship must always be a job with training in a skilled occupation lasting at least 12 months, leading to full competency in that occupation. The current target – set out in 2015 - is that all existing apprenticeship frameworks will be replaced by new standards by 2020. Responsibility for managing this process and for approving new standards now rests with the IFA.

3.2.4 Apprenticeship Levy

In Spring 2017, the way the government funds Apprenticeships in England changed. Some employers will be required to contribute to a new Apprenticeship Levy, and there will be changes to the funding for Apprenticeship training for all employers. The Apprenticeship Levy requires all employers operating in the UK, with a pay bill over £3 million each year, to make an investment in Apprenticeships.

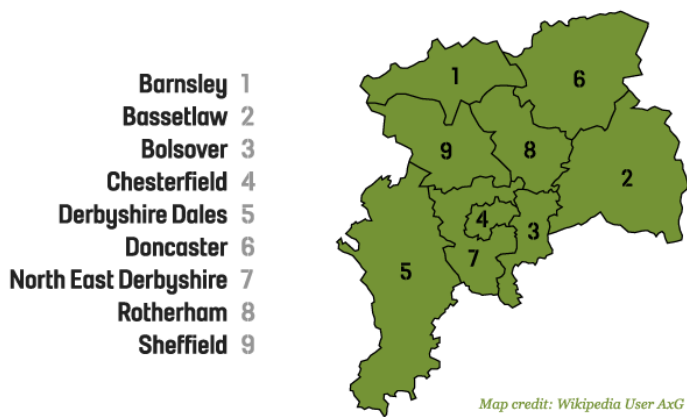
The Levy will be charged at a rate of 0.5% of the annual pay bill and employers will have a Levy allowance of £15,000 per year to offset against it. This exemption means that most of the 1 million smaller employers will not pay the levy but around 20,000 larger and medium sized employers with payrolls over £3 million will do so. Once the Levy is declared, employers will be able to access funding for Apprenticeships through a new digital Apprenticeship service account and use this to pay for training and assessment for Apprentices. The service will also help employers find training providers to help them deliver Apprenticeship programmes. Between now and spring 2019, the digital system is only for use by levy paying employers but the longer-term plan is to extend it to all those training apprentices.

3.2.5 Institutes of Technology (IoTs)

Institutes of Technology were first announced in the Productivity Plan in July 2015. A further announcement in January 2017 saw the Government pledge £170m as part of its Industrial Strategy towards the creation of Institute of Technologies (IoTs). These Institutes of Technology will deliver education in science, technology, engineering and mathematics (STEM) subjects and the DfE will focus particularly on skills at level 4 and 5 but will also extend to degree level and above (level 6+) to strengthen routes into higher levels of technical education, as well as directly into employment. Successful bidders will receive the right to call themselves Institutes of Technology and receive funding 'for capital investment to support high quality, industry-standard facilities and equipment' as well as 'cover new build investment or upgrades and improvements to existing assets'.

3.3 Regional Context

The Sheffield City Region area covers the areas detailed below. It has a total population of 1.84 million people. The largest towns in the area are Barnsley, Chesterfield, Doncaster and Rotherham



3.3.1 Employment

The Sheffield Region strategic economic plan 2014 identifies the need to create 30,000 jobs in highly skilled occupations as a key component of an overall target of 70,000 new job growth across the region.

In addressing this target, the economic plans for the region make clear the employment context within which these jobs targets should be achieved.

Thus, in the SCR, four main sectors of employment dominate:

- Wholesale and retail
- Health and Social Care
- Business, Professional and Financial Services
- Manufacturing

The SQW Report (2016) highlight that key sector employment and growth opportunities can be found in

- Advanced Manufacturing,
- Health Technologies,
- Creative and Digital Industries,
- Low Carbon Industries,
- Logistics

Whilst EMSI (2015) identify the following specific industries which are over represented in the SCR area:

- Manufacture of cutlery
- Manufacture of Refractory products,
- Copper Production, and Cold Drawing of Wire

Furthermore, the SCR area is marked by a lower proportion of all jobs in the highest skill occupations - 38% compared with 43% in the rest of the UK

According to projections by the Combined Authority, levels of employment growth will vary across the Region. The number of residents entering employment (whether inside or outside local authority boundaries) is forecast to be below the national average in the majority of areas, suggesting that high unemployment will continue for some years after employment has recovered nationally. Therefore, it is important for the SCR area to identify where the best opportunities may lie for achieving its jobs growth targets.

3.3.2 Future Economic and Skills Trends

Projections of future trends in the SCR area, highlight an expectation of a growth of 39,000 new jobs outweighed significantly by the need to fill 302,000 jobs to replace workers retiring, or leaving the workforce. This is due to the significant levels of employment of 55+ year olds, particularly in the Manufacturing and Distribution industries. It is likely that replacement demand will mean job opportunities across all industrial sectors and occupations, but overall job levels will vary between sectors and occupations.

The demand for higher qualification and skills levels will continue with 46% of all jobs in the region projected to require Level 4 or above qualifications by 2022, up from 36% in 2015. Overall, opportunities for those with low qualifications are likely to decline whilst particular skills needs are projected across degree level qualifications and above. However, demand for Level 4-5 provision is expected to be much less significant.

A key risk for the region is automation and its impact on jobs. Estimates suggest that up to 280,000 jobs across the region could be at high risk from automation with this most likely to affect employment in Accommodation and Food Services, Manufacturing, Transport and Storage, and Wholesale and Retail.

3.3.3 Sector Opportunities

Opportunities are likely to emerge from key investments across the SCR area including research centres in the ‘factory of the future’ and Advanced Wellbeing; transport and infrastructure improvements include a new link road to the M18, Trans-Pennine routes; employment and housing growth schemes around Sheffield and Doncaster, a new intermodal port and logistics complex, the UKs largest at Doncaster; and a new Rail Engineering Campus in Doncaster.

The Curriculum Planning Tool in Appendix 1 identifies where these investment opportunities are in progress, and where there are significant opportunities for developing new pipeline demands for suitably trained and highly skilled individuals.

3.3.4 STEM Employment within the SCR

SCR EMSI data shows that across the 21 Priority Occupations associated with the higher skilled STEM in the SCR area the total number of jobs in these occupations are projected to increase from 55,442 in 2015 to 57,832 in 2022 a rise of 2,390 jobs which represents 8% of the SCR target of 30,000 new highly skilled occupations by 2022.

In addition, initial estimations provided by the Sheffield LEP are that inward investment companies falling into the STEM employment sectors will be generating around 5,000 new jobs within the SCR.

A summary of the current projected pattern of employment in the Sheffield City Region by occupation is as follows:

	2015 jobs	2022 jobs	Diff	Replacement demand to 2020	TOTAL	Vacancies 2016	Key sectors employed in % order
2129 Engineering Professionals not elsewhere classified	1,779	1,831	+52	251	303	405	Manufacturing, Construction, Wholesale and Retail
2133 IT Specialists	3,983	4,151	+168	428	596	32	Creative and Digital, Business, Professional, and

							Financial services, Manufacturing
2136 Programmers and Software Development Professionals	4,245	4,513	+268	320	588	316	Creative and Digital, Business, Professional, and Financial services, Manufacturing
2139 IT and Telecommunications Professionals	2,600	2,762	+162	254	417	56	Creative and Digital, Business, Professional, and Financial services, Manufacturing
3111 Lab Technicians	2,151	2,265	+114	404	518	295	Health and Social Care, Education, Business, Professional, and Financial services, Manufacturing
3113 Engineering Technicians	1,516	1,562	+45	249	294	1,070	Manufacturing, Construction, Wholesale and Retail, and Business, Professional, and Financial services
3119 Science, Engineering & production Techs	877	912	+34	211	245	795	Manufacturing, Construction, Wholesale and Retail, and Business, Professional, and Financial services
3122 Draughtspersons	839	868	+29	178	207	265	Manufacturing, Construction, Creative and Digital
3131 IT Operations Technicians	2,289	2,394	+105	208	313	1,099	Creative and Digital, Business, Professional, and Financial services, Education
3132 IT User Support Technicians	2,184	2,310	+125	159	284	1,644	Creative and Digital, Business, Professional, and Financial services, Education
5215 Welding Trades	2,559	2,525	-34	452	418	431	Manufacturing; Construction; Wholesale and Retail
5221 Metal machining setters and setter operators	2,589	2,413	-175	579	404	338	Manufacturing, Construction, and Wholesale and Retail
5223 Metal Working production and maintenance fitters	5,733	5,773	+40	1,334	1,374	677	Manufacturing, Wholesale and Retail, and Construction
5231 Vehicle Technicians, mechanics and electricians	5,657	6,099	+442	648	1,090	1,084	Wholesale and Retail, Transportation, Manufacturing
5241 Electricians and electrical fitters	5,189	5,477	+289	913	1,202	877	Construction, Manufacturing, Business, Professional and Financial services, Wholesale and Retail
5249 Electrical and Electronic Trades	1,679	1,791	+112	341	453	890	Manufacturing, Construction, Business Professional and Financial Services, and Creative and Digital
5250 Skilled Metal, electrical and electronic trade supervisors	1,333	1,367	+34	254	288	24	Manufacturing, Wholesale and Retail, and Construction
5314 Plumbers and heating ventilating engineers	2,227	2,526	+299	309	608	423	Construction, Manufacturing, Business, Professional and Financial services, and Utilities.
5315 Carpenters and Joiners	2,341	2,336	-5	383	378	107	Construction, Manufacturing, Business, Professional and Financial services, and Wholesale

							and Retail.
5319 Construction and Building Trades	2,062	2,168	+106	474	580	71	Construction, Manufacturing, Business, Professional and Financial services, and Wholesale and Retail.
5330 Construction and Building Trades Supervisors	1,611	1,790	+179	415	594	7	Construction, Manufacturing, and Business, Professional and Financial services.

EMSI Data

Appendix 1 Priority STEM Occupational Review tool provides a more detail breakdown of the occupations including descriptions of the job roles involved, future sectorial opportunities and challenges.

In total, the EMSI data estimates suggest there will be an increase in 2,390 jobs by 2022, and a replacement demand of 8,800 jobs by 2020 linked to the 21 Higher Level STEM occupations.

3.3.5 Learner Demographics

Across the SCR, 16-18 numbers are projected to decline over the period 2016 to 2019 with a decline of more than 2.5% in each year from 2016 to 2019. There is then a projected increase in 16 to 18 numbers until 2029 with the largest increases being in 2022 and 2024.

Overall 19 to 24 figures are projected to decline steadily until 2024, and then increase again until 2032

3.3.6 Performance of Schools at Key Stage 4

The overall performance of schools at year 11 within the review area is generally below the national average.

The table below shows the % young people achieving five GCSE's A*- C including English and maths in each of the areas of the SCR compared to the national average in 2014/15

Area	%	National Average
Barnsley	49.8	57.5
Doncaster	50	
Rotherham	55	
Sheffield	54.5	

SCR LMI Report 2017

Clearly poor performance in English and Maths will be a limiting factor as young resident's ability to access the opportunities described in this report as well as placing a wasteful burden on post-16 providers. It is also likely to be a contributing factor on the low take up of Higher Education by SCR residents.

4. SCR Findings

This section details the specific STEM level 3+ findings in curriculum provision for the SCR following the analysis of the data provided by RCU. The detail behind these findings can be found in the following appendices:

- Appendix 6 - overarching STEM report for the SCR.
- Appendix 7 – Occupation Reports
- Appendix 8 – 16-18 outputs.

4.1 EFA and SFA funded providers and including 24+ Advanced Learner Loans.

There were 46,480 post 16 learners who lived in the SCR area in 2015/16 registered on courses offered by in-scope SCR providers. The table below shows the breakdown of this:

		Learner Numbers
Total post 16 learner's SCR Residents		46,480
Studying core & related Stem Level 3+		11,250
Of Which:	16-19 Study Programmes	6,570
	Adult Skills Budget (non Apps)	740
	Adult Skills App	3,330
	24+ Advanced Learner Loans	670

2015/16 National ILR R14 (numbers rounded to the nearest 100)

The table above illustrates that 11,250 learner's resident within the SCR region are studying core and related STEM Level 3 and above qualifications. 58% of those learners are on 16 – 19 study programmes which are weighted towards A-levels and 42% are Adult Learners.

In addition, there are 33,180 HE learners in the SCR studying core or related STEM Level 4+ qualifications

The following sections provides the detail within each provision type

4.1.1 16-19

Vocational

A detailed analysis of learners studying core and related qualifications for the priority groups is shown at appendix 1. However, by definition, 'related qualifications' provide a broader range of options particularly for this age group and it is therefore useful to separate out those studying for the core qualifications as follows.

Occupation	Related & Core	Core
2133 IT specialist managers	1510	720
2136 Programmers and software development professionals	1250	720
2139 Information technology and telecoms professionals nec	1510	720
3131 IT operations technicians	1760	720
3132 IT user support technicians	1760	720
3111 Laboratory technicians	590	540
2129 Engineering professionals nec	910	340
3113 Engineering technicians	950	370

3119 Science, engineering and production technicians nec	1000	370
3122 Draughtspersons	1730	0
5215 Welding trades	460	10
5221 Metal machining setters and setter-operators	1150	340
5223 Metal working production and maintenance fitters	950	10
5231 Vehicle technicians, mechanics and electricians	920	110
5241 Electricians and electrical fitters	820	90
5249 Electrical and electronic trades nec	820	90
5250 Skilled metal, electrical and electronic trades supervisors	1100	90
5314 Plumbers and heating and ventilating engineers	660	40
5315 Carpenters and joiners	30	30
5319 Construction and building trades nec	390	20
5330 Construction and building trades supervisors	320	120

2015/16 National ILR R14 (numbers rounded to the nearest 100)

Within this table we have sought to group 'like' occupations. We then need to make certain assumptions as follows:

- That due to the nature of these industries a core qualification for a Programmer & Software Development Professional may also be directly relevant to an Information Technology & Telecomms Professional. Therefore, the same 70 learners are accounted for under each heading
- Level 3 programmes will generally be over 2 years therefore numbers shown can be halved to give an annual outturn
- A significant number of learners in areas such as IT and Engineering will be seeking to progress to HE, especially in the absence of higher level Apprenticeships
- However, in craft based programmes such as carpenters, joiners and welders there is a high likelihood that individuals are studying for direct entry into the workplace. If we look at supply v demand for these over the 4-year period, the following is seen:

Occupation	New Jobs 2022	Replacement Demand 2020	Vacancies 2016	Total Demand To 2022	Annual Demand Total	Annual Supply Total
Carpenters & Joiners	-5	383	107	485	183	60
Electricians and electrical fitters	289	813	877	1979	934	180
Vehicle technicians, mechanics and electricians	442	648	1084	2174	2047	220
Welding Trades	-34	452	431	849	517	20

Calculated on the basis if EMSI data supplied by SCR

This analysis shows that there will be low numbers of 16-18 year old who are currently studying vocational qualifications entering the workforce that will have the skills needed in the above occupations and therefore employment for this demand will have to come from other qualification sources.

The table in section 5 of this report shows the overall demand and supply for each of the occupations

Trends in 16-19

The table below shows the trends in 16-19 year old learners since 2013/2014 studying level 3+ vocational core STEM qualifications by occupations

Occupation (Core STEM only) 16-19 Funding Stream (number of Learners) Level 3+ Vocational Qualifications	2013/14			2014/15			2015/16		
	Inscope Providers	UTC Sheffield	Other Providers	Inscope Providers	UTC Sheffield	Other Providers	Inscope Providers	UTC Sheffield	Other Providers
Engineering Professionals	460	60	160	400	150	190	380	190	290
Information Technology & Telecommunications Professionals	860	0	710	810	0	640	780	0	630
Science, Engineering and Production Technicians	900	60	660	910	150	760	950	190	1,030
Information Technology Technicians	870	0	710	810	0	640	780	0	630
Metal Forming, Welding and Related Trades	10	0	0	10	0	0	10	0	0
Metal Machining, Fitting and Instrument Making Trades	450	60	160	390	150	190	380	190	190
Vehicle Trades	140	0	20	130	0	10	110	0	10
Electrical and Electronic Trades	130	0	10	130	0	<5	90	0	<5
Skilled Metal, Electrical and Electronic Trades Supervisors	130	0	10	130	0	<5	90	0	<5
Construction and Building Trades	60	0	<5	90	0	10	60	0	<5
Construction and Building Trades Supervisors	110	0	30	110	0	40	120	0	20
STEM	2,100	60	1,380	2,030	150	1,380	2,030	190	1,630

2013/14, 2014/15, 2015/16 National ILR (numbers rounded to the nearest 100)

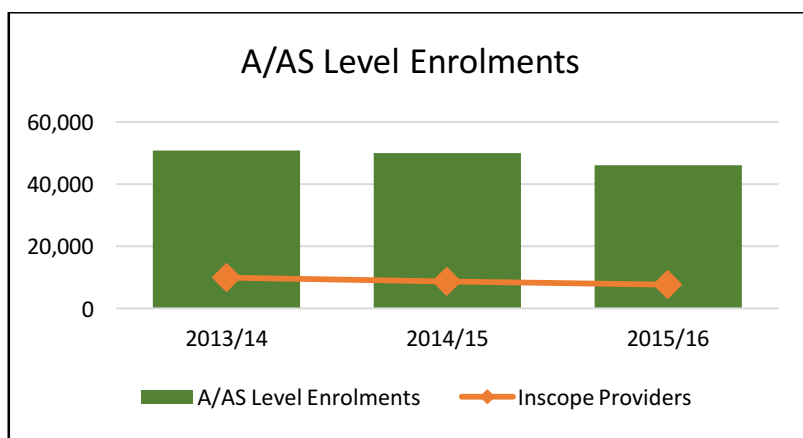
The findings show:

- Learner numbers over the last 3 years have increased by 310 (9% increase) overall.
- Within the Providers the trend has been as follows:
 - Remained static within in-scope providers
 - Increased by 31% in the UTC
 - Increased by 18% in other providers.
- Occupations that have seen the greatest increase in learners over the last 3 years have been in:
 - Science, Engineering and Production Technicians (34% increase)
 - Engineering Professionals (26% increase)
- Occupations that have seen the largest decrease in learners over the last 3 years are:
 - Information Technology and Telecommunications Professionals (decrease of 10%)
 - IT Technicians (decrease of 9%)
 - Vehicle Trades

This last point is significant given the demand for vehicle trades and IT professionals going forward as well as the high volume of current vacancies

A Level Provision

In addition to the above learners on vocational qualifications there are some 2,220 learners studying for A-level subjects. In line with demographics the number of enrolments in A-Levels in the SCR overall have been declining since 2013/14 (from 50,720 total enrolments in 2013/14 to 46,070 in 2015/16)



2013/14, 2014/15, 2015/16 National ILR (numbers rounded to the nearest 100)

The following trends can be seen over the last 3 year period in relation to STEM related to A-Levels within the SCR likely to match most closely to the priority occupation groups:

SSA	Enrolments 13/14	Enrolments 14/15	Enrolments 15/16
Science & Mathematics	950	1150	1530
Engineering & Manufacturing	800	840	880
Construction	300	330	290
ICT	1610	1450	1420
TOTAL (enrolments)	3660	3770	4120

2013/14, 2014/15, 2015/16 National ILR (numbers rounded to the nearest 100)

The data shows that in contrast to the overall position with A Levels, the number of enrolments linked to STEM related subjects has been the reverse of the demographic decline and has risen by 12.5% overall. There has been a significant increase in the number of learners studying maths and higher maths, critical for the higher skill requirements of a number of the priority occupations.

The reduction in ICT mirrors that for equivalent vocational programmes. Further work is required to establish if students are now following alternative routes to HE provision in this area.

We cannot know from the data what the desired pathways are for each individual represented in the above statistics, that is whether their next step is work, an apprenticeship or further/higher education.

It would be reasonable to assume that a majority of those studying for core qualifications for occupations in the traditional craft areas such as welders, carpenters and joiners are seeking direct entry to the workforce. Although the total jobs in these occupations are predicted to decline, we can see from table above that there is insufficient output from this group alone to meet the total demand over the period when replacement requirements are taken into account.

The increase in the numbers of learners studying maths and higher maths is a positive development particularly in light of the results for the region at GCSE level, but the reduction in the numbers studying for ICT or equivalent courses is of concern.

The position for a number of other occupations requires a higher level of analysis as many of these students, in addition to those studying A levels, will be looking to progress to higher

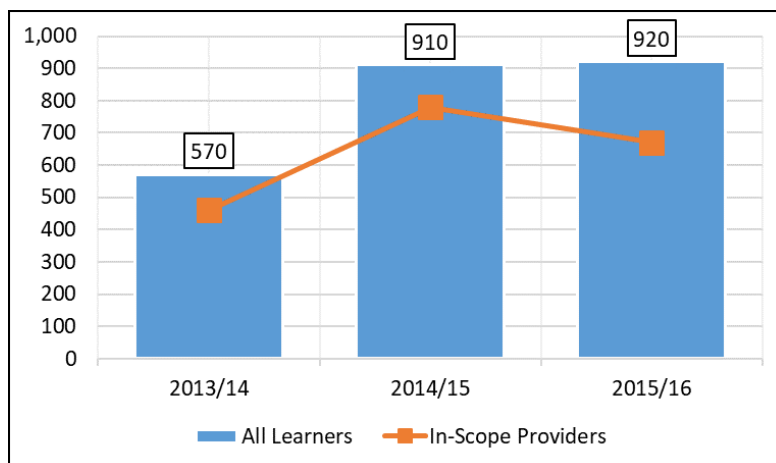
education. It is likely that more would also consider progressing to higher level of apprenticeships were these to be available. This is dealt with below at section 4.2

4.1.2 Advanced Learner Loans (L3+)

Adult Learner Loans were introduced in 2013/14 with the intention that they would parallel the system of HE fees. The policy originally applied to those aged 24 plus though this was subsequently widened to the 19+ age group.

Our analysis has identified a total of 670 learners accessing advanced loans through the providers in scope in 2015/16 (920 learners in total in the SCR). This represents around 73% of the total advanced learner loan provision in priority STEM subjects accessed by SCR residents

The graph and figures below show the growth in total learners (SCR residents) on L3 STEM **24+ Advanced Learning Loans**, and their respective volume of this provision delivered by the SCR in scope providers.



2013/14, 2014/15, 2015/16 National ILR (numbers rounded to the nearest 100)

Further analysis shows that the majority of provision is in health care related provision with the greater part of that being in access programmes where the initial loan is waived once the individual successfully accesses the HE system. Only 16% of demand is in core STEM subjects.

Looking at the 21 priority occupations we note the following findings:

- In most instances, the provision is static. The exceptions to this are;
 - Laboratory Technicians: significant decline from 220 in 2013/4 to 40 in 2015/16
 - IT Operations Technicians, IT User Support technicians and Programmers and Software Developers have declined over the past 12 months
- The majority of provision is delivered by Colleges and the vast majority of learner's study at their local institution. The 3 main providers are as follows:
 - The Sheffield College
 - Doncaster College
 - RNN Group

With Chesterfield, Barnsley and The Manchester College delivering smaller elements of provision.

- 90% of the learners are accessing a level 3 qualification and only 10% are accessing a level 4.
- For most of the priority occupations the qualifications are less than 50% core with a significant element providing access to higher education.
- According to available data a significant number of those accessing this provision already have a full level 3 qualification or above (37%). Equally there are a surprising number of learners whose previous level of qualification is at Level 1 or less (20%).

Summary

Based on the evidence we have seen it would be reasonable to conclude that Adult Learner Loans in their current form do not provide a significant opportunity for the SCR in tackling the skills needs within the STEM priority occupations. That said, further work should be carried out to understand why they have proved popular for the health and care related sectors to assess whether there is an opportunity to create similar demand in other STEM areas.

4.1.3 Adult Skills Budget

There is a potential strategic gap between the SCR economic forecast target for a minimum 8% increase in new jobs in higher skilled STEM occupations by 2022, and the current declining supply of suitably skilled and job ready classroom based learners at the vocational 19-23-year-old phase. The table below shows the total SCR resident learner numbers in Core STEM Adult Skills Budget (non-Apprenticeships) (ASB) classroom based learning attending in-scope providers. The total number of residents on Core STEM Adult Skills Budget (non-Apprenticeships) was 380 learners.

Provider Name	Total Learners
THE SHEFFIELD COLLEGE	130
RNN GROUP	60
CHESTERFIELD COLLEGE	50
DONCASTER COLLEGE	40
BARNSELY COLLEGE	30
DEARNE VALLEY COLLEGE	10
NORTH NOTTINGHAMSHIRE COLLEGE	10
THOMAS ROTHERHAM COLLEGE	<5
LONGLEY PARK SIXTH FORM COLLEGE	<5

Source: 2015/16 National ILR R14 (Numbers rounded to the nearest 10)

The table below shows the supply of main subject areas for Core STEM Adult Skills Budget (non Apprenticeships).

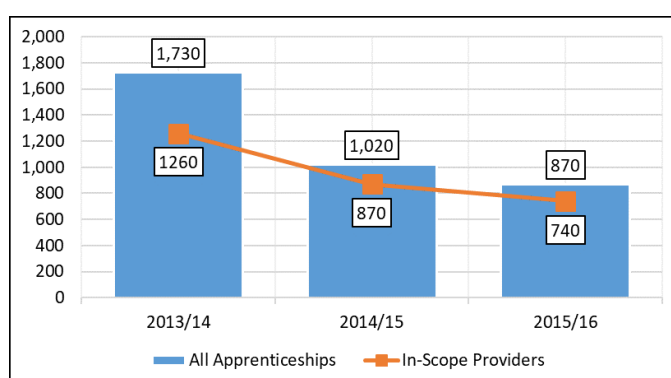
Core STEM Subject Areas	Total Learners
Building and Construction	90
Science	80
Engineering	80
ICT Practitioners	50
Transportation Operations and Maintenance	40

ICT for Users	20
Mathematics and Statistics	10

Source: 2015/16 National ILR R14 (Numbers rounded to the nearest 10)

Our findings are as follows:

- The analysis of the learning aims baseline undertaken for this cohort shows that around 10% are studying Access to Higher Education Diplomas in Science with a further 5% on BTEC Subsidiary Diploma in Construction and the Built Environment.
- There is an identified baseline of 43% (380 learners) of the total 19-23 cohort (870 SCR resident learners) who are studying L3+ Core STEM subjects. The remaining learners from this baseline number are studying Health and Social Care related subjects, rather than subjects specifically related to the needs of the 21 Priority STEM occupations identified by the SCR as critical to the future employment growth (Job Growth and Replacement Demand).
- It is the case that recent and successive CSR⁵ periods of funding reductions to unprotected and non-loans adult skills budgets at level 3 and above, has led to a noticeable decline in volumes of Level 3 + priority STEM skills supply in this area of provision as shown below



Source: 2015/16 National ILR R14 (Numbers rounded to the nearest 10)

- There is an evident under-supply of 19-23 (non loans) studying core and related STEM at L3+ (740 learners in 2015/16 at the in-scope SCR based Colleges). This means there is a greater reliance on University delivery for these highly skilled STEM areas and the HE in FE provision. This could be a risk for GFE's seeking to develop their HE provision given the dominance of the University brands but could equally provide an opportunity for those Colleges who already have HE provision in reasonable volumes to develop their provision to suit their particularly markets
- As stated above the delivery under the adult skills budget has fallen dramatically over the period. This has applied across all areas other than, Electricians and Electrical Fitters and Electrical and Electronic Trades where numbers have been static, and Plumbing, Heating and Ventilation Engineers where the numbers have actually increased from 70 to 110 between 2013/14 and 2015/16.
- That said, the analysis also indicates that for most of these occupations the numbers have stabilised after an initial steep decline with a much smaller drop between 2014/15 and

⁵ Comprehensive Spending Review (CSR)

15/16 than in the previous year. The exception to this is in the construction trades where there continues to be significant falls in those following core or relevant qualifications.

- The greatest fall over the period has been for the qualifications linked to the occupation group lab technicians which has seen a decline from 370 to 120. 68% of the provision here is classified as core.
- 100% of these courses are delivered at Level 3.
- This cohort represents around 10% of the total delivery from all providers to SCR post 16 residents.

Reason for the decline in numbers

The Adults Skills Budget has declined for a number of reasons:

- The years from 2013-14 to 2015-16 experienced the steepest funding reductions. This was partly deliberate in that the 2010 spending review settlement back loaded the cuts to FE for the 3rd and 4th years which was when FE loans started (and nationally take-up was low).
- There was also a drive to increase apprenticeships using existing resources with ring-fencing of 19+ apprenticeship allocations within the overall ASB and this all added up to substantial national cuts to the "other" ASB in those two academic years.

In addition to this it is likely that there was impact from:

- falling unemployment/rising employment which may have changed incentives for learners
- colleges finding it harder to keep adult provision going in terms of cost/income and (in some cases) letting key people go in redundancy programmes which ended the courses at the same time
- the relentless programme of changing qualifications as well as significant change in those qualifications eligible for funding
- a general lack of interest and innovation in an area which was getting smaller

Summary

A point of concern for the SCR is that the majority of delivery is for the 19 to 24 age group with some delivery for some occupations being entirely for adults in this age group for example Engineering Professionals, Electrical and Electronic Trades, Metal Working and Production and Maintenance Fitters. This is likely to include 'accidental adults' that is those who are age 19 in the last year of their course.

The inference of this is that the older workforce either already has these skills, in which case the replacement demand is that much more critical and the reduction in the ASB even more concerning, or that older workers will become gradually deskilled and at greater risk as the job market demands higher skills in the future.

4.2 Apprenticeships

There were 39,150 on-programme apprenticeships in 2015/16 (all levels and from all providers). The breakdown of this is as follows:

	Number of Learners	%
Intermediate Level Apprenticeships	22,620	58%
Advanced Level Apprenticeships	14,900	38%
Higher Level Apprenticeships	1,620	4%
Total number of apprenticeships in SCR (all providers)	39,150	

The table below shows the breakdown of these Apprenticeships between Advanced and Higher Level Apprenticeships:

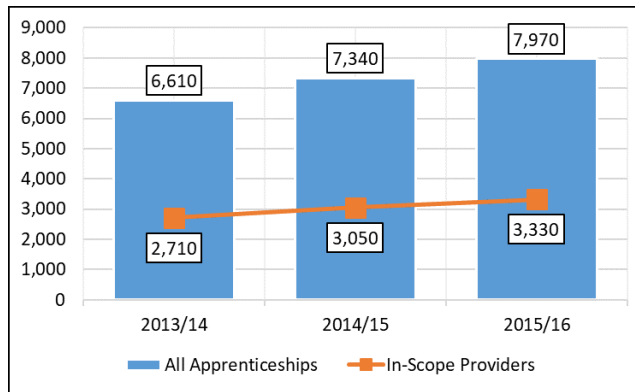
	Total Apprenticeships in SCR	Apprenticeships in STEM	% of STEM Apprenticeships
Advanced Level	14,900	7,300	49%
Higher Level	1,620	670	41%
TOTAL	16,520	7,970	

Overall, 42% of apprenticeships within the SCR are being undertaken at Level 3 and above. However, most critically for the future more highly skilled needs of the SCR economy only 4.1% are being undertaken at Higher Level (L4 and above).

With regards to STEM Apprenticeship volumes, 49% of the total Advanced Level Apprenticeships are linked to STEM apprenticeships and 41% in respect of Higher Level Apprenticeships. However, SCR STEM Advanced and Higher Level Apprenticeships are particularly focused in Health Care Sector frameworks (2,460 starts) rather than areas more directly related to the specific needs of the Manufacturing, Engineering, Construction and IT industries that dominate the needs of the 21 Priority STEM occupations identified by SCR

Our analysis of apprenticeships in the SCR shows:

- The total volume of SCR STEM advanced and higher apprenticeship delivery split is 49% and 41% respectively.
- SCR STEM Advanced and Higher Level Apprenticeships (total 7,970 Apprenticeship starts in 2015/16) are particularly focused in Health Care Sector frameworks (2,460 starts – Advanced Level and 540 starts Higher Level) rather than areas more directly related to the specific needs of the Manufacturing, Engineering, Construction and IT industries that dominate the needs of the 21 Priority STEM occupations. In addition, the same trend can be seen at Level 4 with 80% of the higher level apprenticeships being in health and social care and only 20% linked to core STEM subjects.
- 37% of all apprenticeships are delivered by the in-scope providers (total of 3,020 apprenticeships) of which 2,900 are advanced and 120 higher apprenticeships).
- Since 2013/14 there has been a relatively increasing demand profile for STEM based apprenticeship frameworks rising from 6,610 to 7,970 in 2015/16. 92% of all these Apprenticeships are Advanced and 8% are Higher Level.



Source: 2015/16 National ILR R14 (Numbers rounded to the nearest 10)

- Prior attainment shows that 16% of students have already achieved a level 3 qualification and 22% have either a level 1 or no qualification.
- The take up of apprenticeships is predominately in the age group of 19-24 and 25+. These age groups account for 79% of all STEM apprenticeships.
- The in-scope Private Training Providers deliver some 4,460 of the STEM Apprenticeships, which is 56% of the total SCR resident cohort. Colleges deliver 2,960 apprenticeships whilst a further 550 were delivered by Other providers.
- There is a low take up in Apprenticeships for the following occupations:
 - Lab Technicians
 - Carpentry and Joinery
 - IT related qualifications
- There is a high take up in Apprenticeships in the following occupations:
 - Electrical Trades
 - Metal Working Trades
 - Engineering Trades

Summary

Although around half of all Apprenticeships are in STEM subjects, the new higher skilled occupations are under-represented in relation to the potential demand profile and opportunities and this would warrant a focus on by the SCR and its partners to identify ways these might further support future higher skilled occupational job opportunities.

4.3 Higher Education (HE)

There are a total of 33,180 students studying relevant or core STEM HE qualifications at one of the in-scope providers

By Occupation Group the numbers studying relevant or core qualifications are as follows. As we can see from the table below, each qualification is relevant to a range of occupations and therefore one course, or learning aim can support a learner into a number of destination occupations.

Occupation	Quals
Laboratory Technicians	19,370
Science Engineering and Production Technicians	9,440
Metal Machine Setters & Setter Operators	9,070
Engineering Professionals Engineering Technicians Metal Working and Production & Maintenance Fitters	8,920
Welding Trades	7,160
Vehicle Technicians, Mechanics and Electricians	6,770
Draughtsperson	6,030
IT User Support Technicians IT Operations Technicians	5,620
IT Specialist Managers IT & Telecoms Professionals	5,590
Construction and Building Trades	4,380
Construction Supervisor	4,370
Electrical and Electronic Fitters	4,170
Plumbers and Heating and Ventilation Engineers	2,590
Carpenters and Joiners	2,300
Programmes and Software Development Professionals	5,550
Skilled Metal, Electrical and Electronic Trades Supervisors	4,510

2014/15, 2015/16 National ILR R14 (numbers rounded to the nearest 100)

The University of Sheffield and Sheffield Hallam are the main providers as would be expected but there is significant provision in a number of the in-scope providers as show below:

Provider	Number
University of Sheffield	16,430
Sheffield Hallam University	15,420
Doncaster College	370
Chesterfield College	330
The Sheffield College	300
RNN Group	130
Barnsley College	160

HESA 2015/16 data and 2015/16 National ILR R14 (numbers rounded to the nearest 100)

The breakdown by age makes a distinction at age 21 and therefore captures in the 21-24 category those younger students who will qualify with their first degree as well as more mature students studying higher level programmes or returning to learn either directly or through access programmes delivered through the learner loans or ASB.

Age

Age	Number	%
To 21	15,200	46
21-24	9,390	28
25+	8,630	26

HESA 2015/16 data and 2015/16 National ILR R14 (numbers rounded to the nearest 100)

It would be worthwhile carrying out a trend analysis to identify both the impact on older adults resulting from the introduction of student loans and to track the progression of learners on access programmes to measure whether HE programmes are acting as a

counterweight to the drop in ASB programmes and the lack of take up of adult loans in the priority occupations.

4.4 Travel to Learn

An analysis of the Travel to Learn Data along with interviews from the Stakeholders shows that the vast majority of students do not travel out of the area to study, but would access provision as close as possible to their home location. This was described in a number of interviews as being a cultural issue, but there was a point made that cross-area travel limited choice. A number of colleges described their strategy as being that of a college for their local community.

There was no evidence to suggest a significant shortfall in local provision driving learners to choices out of area.

4.5 Summary statistical data

4.5.1 Learner numbers and Job requirements

The table below summarises the headline statistical figures in relation to STEM Level 3+ learners in the SCR:

		Number
Jobs	Increase in STEM Occupations Jobs (2015 – 2022)	2,390
	Replacement Demand in STEM Occupations (by 2020)	8,800
	Estimation of new jobs generated as a result of potential inward investment	(5,000)
	TOTAL Occupation Requirements (Jobs)	11,190 (16,190)
Learners	16-19 Study programmes	6,570
	Adult	4,740
	Higher Education (HE)	33,180
	TOTAL LEARNERS: studying Core & Related STEM Level 3+	44,490
Apprenticeships	Advanced Level (STEM LVL 3) Apps	7,300
	Higher Levels (STEM LVL 4) Apps	670
	TOTAL (STEM LVL 3+) Apps	7,970

EMSI data supplied by SCR and 2015/16 National ILR R14 (Numbers rounded to the nearest 10)

The figures above give an indication of the total number of learners enrolled on STEM level 3+ qualifications within in-scope providers within the SCR.

These figures, however, do not take into account the annual outturn of learners achieving a core or related STEM qualifications as a comparison of the annual requirement for jobs. This would provide an estimate of whether supply of learners would meet job demands

To be able to give an indicative figure of this annual outturn the learner numbers have been pro rata'd by the number of years required to complete the qualification and jobs divided by the number of years shown. The table below shows this analysis

		Number per annum
Jobs	Increase in STEM Occupations Jobs (2015 – 2022 – 7yrs)	342
	Replacement Demand in STEM Occupations (by 2020 – 5 years)	1,760
	Estimation of new jobs generated as a result of potential inward investment (5 years)	(1,000)
	TOTAL Occupation Requirements (Jobs)	2,102 (1,000)
Learners	16-19 Study programmes	3,285
	Adult	2,370
	Higher Education (HE)	23,086
	TOTAL LEARNERS: studying Core & Related STEM Level 3+	28,741
Apprenticeships	Advanced Level (STEM LVL 3) Apps	3650
	Higher Levels (STEM LVL 4) Apps	335
	TOTAL (STEM LVL 3+) Apps	3985

EMSI data supplied by SCR and 2015/16 National ILR R14 (Numbers rounded to the nearest 10)

The analysis shows that there is an annual requirement of approximately 2,100 jobs (either new jobs or replacement) in the 21 priority occupations within the SCR and an annual outturn of learners circa 30,000 with either a core or related STEM qualification showing that a top level there is sufficient supply to meet demand.

Section 5 looks in detail at this supply and demand by occupation level.

4.5.2 Qualification Level

The table below shows the split between Learners studying core or related stem qualifications at Level 3 and Level 4.

	Level 3	Level 4	Total	% Split
Apprenticeships	7,450	520	7,970	92/8
Advanced Learner Loans	820	100	920	90/10
Adult Skills Budget	870	-	870	100/0
16-19 Study Programme	6,570	-	6570	100/0
HE		33,220	33,220	0/100
Total (inc HE)	15,710	33,840	49,550	32/68
Total (Excl HE)	15,710	620	16,330	96/4

HESA 2015/16 data and 2015/16 National ILR R14 (Numbers rounded to the nearest 10)

Although this top-level analysis shows that there will be sufficient supply of labour with level 4+ qualifications in core or related stem qualifications this supply will mainly come from HE students, assuming all these learners decide to take up opportunities within the STEM priority occupations. There does seem to be a 'gap' in the older workforce studying for a higher level qualification. There is a risk if this continues the older workforce could become deskilled as the jobs market requires higher level of skills.

4.6 Summary SWOT analysis of STEM Level 3 within the SCR

The following section summarises the findings of the analysis of the SCR data into strengths, weaknesses, opportunities and threats

STRENGTHS	WEAKNESSES
<p>Overall</p> <ul style="list-style-type: none"> Growth sector with a forecasted growth of 2,390 STEM jobs by 2022 and an inward investment of circa 5,000 jobs <p>16-18 year olds</p> <ul style="list-style-type: none"> Increase in learners studying vocational core stem subjects (+9%) over the last 3 years Increase in learners studying A-Levels related to stem (+12.5%) over the last 3 years Significant increase in the number of learners studying maths and higher maths critical for higher skill requirements of a number of priority occupations <p>Apprenticeships</p> <ul style="list-style-type: none"> Good track record of growth within apprenticeships which has seen an increase of 18% since 2013/14 to 2015/16 High take up of Apprenticeships in the following occupations: Electrical Trades, Metal Working Trades and Engineering Trades <p>Advanced Learner Loans</p> <ul style="list-style-type: none"> Growth in the take up of Advanced Learner Loans from 570 loans in 2013/14 to 920 in 2015/16 73% of total advanced learner loan provision in priority STEM subjects accessed by SCR residents 	<p>Overall</p> <ul style="list-style-type: none"> Take up of higher level qualifications is low within the region (4.1% of apprenticeships, 10% of Advanced Learner Loans and 0% of Learners taking up the Adult Skills Budget at a higher level). <p>16-18 year olds</p> <ul style="list-style-type: none"> UTC and 'other providers' have increased the % learners studying vocational qualifications whilst in-scope providers have remained static, demonstrating a potential inability to recruit students <p>Apprenticeships</p> <ul style="list-style-type: none"> The majority of Apprenticeships delivered by the in-scope providers at advanced and higher level are in health and social care and not STEM Low take up of apprenticeships in the following occupations: Lab Technician, Carpentry and Joinery, IT related occupations <p>Advanced Learner Loans</p> <ul style="list-style-type: none"> Majority of provision is in health care related provision with a greater proportion in access programmes Only 16% of demand is in Core STEM subjects For many of the priority sector occupations the qualifications are less than 50% with a significant element providing access to HE Static provision in the majority of cases over the last 2 years apart from Lab Technicians and IT related Occupations seeing a decline Significant number of learners accessing the provision already have a level 3 qualification or at level 1 or below. It could be concluded therefore that a number of adults are using the loans for retraining purposes

OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> Supply development opportunities in a number of occupations within the SCR (IT Specialist Mgrs, Programme and Software Developers, IT and Telcomms professionals, Welding Trades) Growth area and the assessment of demand indicates significant opportunities for in scope providers to engage with growth industries to deliver the classroom based qualifications <p>16-18</p> <ul style="list-style-type: none"> Review progression and look into the opportunity to increase the number of higher level apprenticeships for those learners in employment <p>Apprenticeships</p> <ul style="list-style-type: none"> Opportunity to target 16-18 year olds as currently 79% are delivered to Adults For colleges to develop links with employers and grow their apprenticeship provision (currently the majority of delivered is carried out by private training providers) Promote higher level apprenticeships <p>Advanced Learner Loans</p> <ul style="list-style-type: none"> To increase proportion of learners accessing level 4 provision. Currently only 10% of loans are linked to Level 4 Review why the take up in health care related subjects has increased and identify any lessons which can be transferred to STEM subjects 	<p>Overall</p> <ul style="list-style-type: none"> Government Policy impacts negatively on the funding for learners and therefore reduces the take up of qualifications at both advanced and higher levels Continued poor take up of higher level qualifications results in a lack of available skills within the SCR to fill the predicted growth in higher level jobs <p>16-18</p> <ul style="list-style-type: none"> UTC and other providers continue to attract learners away from in-scope providers <p>Advanced Learner Loans and Adult Skills Budget</p> <ul style="list-style-type: none"> Government Policy continues to impact negatively and does not encourage the take up of higher level qualifications for adults

5.0 Stakeholder Interview - Findings

5.1 Planning

In terms of planning the General Further Education Colleges (GFEs) use available LMI data gathered from SCR, other regional and national resources as well as the intelligence gathered from departmental managers and from their own marketing and recruitment. A funding system based on enrolled and successful learners has meant that over time, colleges have become particularly sensitive to the former, but take into account demand factors as indicated by local Labour Market Information (LMI).

No single approach prevailed and we were not seeking to identify, nor to recommend, a single 'best model' if such a thing exists. GFEs in particular operated a range of mechanisms dependant on culture from top down to bottom up to something in between.

Sixth Form Colleges (SFCs) were less influenced by LMI data for planning purposes, but did use it for careers guidance. Curriculum planning here was shaped primarily by learner demand (and the influence of parents) and by the expectations of the HEIs.

Schools (that is those with sixth form provision) were similarly influenced by the expectations of the Higher Education Institutions (HEIs) and learner choice.

We were struck by the potential for developing the role of the HEIs and of using their market assessments and links to employers in the wider planning process. Both of the SFCs and the schools with their sixth form provision stated that LMI data was little used in the planning process per se though it was of use to those providing careers guidance and progression advice. They were much more likely to be driven by applications and, more interestingly and as stated above, by the influence of the HEIs in terms of the progression opportunities for their students.

Given that the relevant HEIs are integral to meeting the higher-level skills needs of the City Region and are a progression route for a significant number of the students studying at Level 3 +, then we believe there is value in building on what are already strong links between the parties to ensure that the maximum potential of these relationships are realised. We feel that this also applies to progression for learners on level 3 programmes in FE colleges too. We can see from the gap analysis that the major gaps for FE provision lie in areas where HEIs are strong. That is probably a logical outcome from the roles of the two sectors and the level of qualification required by the end employer. The role of the GFEs in these instances is more likely to be to provide qualifications which enable the learner to access degree programmes from a practical base, or to guide them into a route for higher apprenticeships. In each case, close co-operation between the HEIs, the GFEs and SFCs would be beneficial to all the parties and to the needs of the SCR.

5.2 Structural Change

We were asked to look at the appetite for, and the possibility of, structural change as a mechanism for addressing any identified shortfalls. Both SFCs are currently in the process of joining Multi Academy Trust (MATs) and, if these go ahead, the colleges will be 'subordinate' to the host school. We know from our experience, and from our consultations, that SFCs' are already one step removed from the LMI data. This is explored in more detail elsewhere. The risk though is that the SFCs become more distant from the operation and requirements of the SCR as they focus on the needs of their particular MAT, unless MATs are incorporated into any strategic and planning frameworks that the SCR and its partners put in place.

FE Colleges were of the strong opinion that their greatest strength was in their responsiveness, and that this would not be enhanced by forced partnerships. Indeed, we have seen the proof of this in the national ABR process where cajoled mergers have failed at the shadow of the first hurdle. Instead, Colleges suggested:

- That their responsiveness was a strength which should be protected and enhanced
- That they needed strong LMI data as a basis for effective planning
- That the SCR should perform a broker, rather than a directing, role
- That under this regime they would form alliances where this made sense in terms of sharing risk and reward and that those alliances could, and do, involve competitors where there was commercial advantage as a result.

Our experience would suggest that this is sound proposition and one that the SCR could harness. Having said that, the importance of the colleges and some established providers to the local and regional economy are such that they should expect and welcome a degree of scrutiny from suitable persons in the SCR to ensure that they remain secure and that plans match the needs of the Region. The planning tools set out here and the information supplied by the RCU will assist in that process. A key supplement to this would be provided by the ESFA and any pipeline trends the colleges note themselves, all this intelligence should be used to aid the development of supply in relation to the higher skills levels around STEM the SCR seeks.

5.3 Resources

5.3.1 Specialist Equipment Resources

With the exception of the Advanced Manufacturing Research Centre (AMRC) at Sheffield University, none of the organisations interviewed claimed to have specialist resources beyond those common across the FE sector. That said, most felt that their existing resource was sufficient to meet the needs of currently available demand. The point was made in a number of interviews that they would invest if they could see that there was sufficient demand going forward to justify the level of expenditure required. That said we were also told that there was a significant degree of reticence in making such an investment for two main reasons. First that such spending required certainty over three plus years. While this is a sensible planning horizon, given the current significant uncertainty over both policy and funding (see Section 2.1), most colleges felt they could forecast securely for no more than one.

The second point was related, in that fixed assets, in the form of owned buildings funded by loans, were seen as potentially reducing flexibility and increasing risk. For example, if the shift to apprenticeships continues and a majority of that provision is delivered and assessed on site then physical resources, and the loans that underpin them, are a liability rather than an asset. We are also aware that there is a much greater reluctance on the part of the banks to lend to the sector now and where loans are made that colleges come under significant scrutiny as a result. Both factors are likely to impact negatively on the ability, or willingness, to borrow.

We were also advised that specialist resources made more sense as one climbed the curriculum ladder and came into their own at level 4 and above in which case total demand would be less (and therefore return on investment more difficult) while at the same time taking the college/provider potentially into greater competition with the HEIs. We were unable to identify any examples of colleges combining with others to create such specialist facilities. The recent attempt to develop an Apprenticeship Company may also be an indicator of the practical difficulties affecting the colleges' ability to work collaboratively to deliver a cross region initiative.

AMRC saw their strength as being the specialist resources created within four pathways at the time of their creation. They also identified the critical role played by their significant industry links and their ability to offer progression pathways from intermediate qualifications and apprenticeships right through to higher degrees. We did identify that a similar position applies in terms of replacing physical equipment or in determining that new equipment was required to branch into a new area of work in that the Centre would have to justify the investment based on projected future demand. That said, the AMRC has the benefit of being part of a HEI and therefore any bidding process would be internal rather than through some form of public process as would be the case, for example with colleges and providers.

Reviewing the gap analysis suggests that the HEIs are the key provider for the majority of high priority areas with GFEs being the main providers for medium and low priority areas.

Future specialist requirements

Based on our provisional SCR Gap Analysis and Demand and Supply Matrix, which have assessed the baseline position for higher level STEM skills (currently delivered by SCR providers), the economic inward investment in priority STEM skills, and the known demands for new highly skilled and specialist STEM jobs in the future (required to help meet the SCR targets by 2020); the emerging key priorities for Capital Investment will be to:

- **Consolidate and strengthen the existing specialist Core STEM delivery** where there is a match between the existing supply of priority Core STEM skills, and the forecast for growth in demand for this priority STEM provision.
- **Assess the capacity for these ‘lead’ centers** to provide this potential growth in numbers required over the next five years, the space utilisation this will require, together with new classroom and specialist equipment requirements.
- **Create a networked model and/or clusters of STEM higher-level specialist centers**, which will avoid duplication in planning and developing the future supply chains with employers.
- **Develop a shared facility model**, which will be adaptable and flexible for different aspects of the post 16 STEM curriculum offer.
- **Develop a major opportunity for Capital Investment** that could not only create the modernised environment for higher level skills in Further Education for new Apprenticeship Standards, in partnership with leading SCR employers, but also share these facilities to help drive demand for these same STEM qualifications.

Based on the analysis of demand in the priority occupation groups and taking into account the resource requirements that the curriculum demands then, the priority occupations for capital bids are:

- Engineering Professionals, Technical support and related occupations
- Metal Trades including machine setters, setter operators, metal working production
- Electricians and electrical and electronic trades
- IT systems support
- IT and Lab Technicians
- Construction including Joinery
- Vehicle Technicians mechanics and electricians

In most cases, these are in line with normal expectations of the resource hungry elements of the curriculum. In each case, we would expect any discussion around these would be driven by the analysis shown in the relevant appendix to this report, the existing capacity of providers including current level of utilisation, success (in both outcomes and progression), employer links, and foresight intelligence derived from providers own understanding of emerging trends in supply demands. We would also suggest, in line with the principles above - the need to maximize the return on investment, the potential limits on the size of the available cohorts and the need to take into account the limited travel to learn patterns we were told of during our review - that priority would be given to proposals from two, or more, partners working in collaboration.

5.3.2 Human Resources

In respect of human resources, there was a unanimous view that any form of mapping of what exists would only be useful for a short time after publication as people may well have moved on by the time the information could be used. It was suggested instead that where demand for specialist training was needed then the SCR's point of reference should either be the local provider assuming they were able to meet that demand, or through brokerage where there was more than one potential supplier.

There were a number of instances where shortage of appropriate teaching staff was causing issues, but most of these were common across the SCR and indeed across the sector. These included Maths and English lecturers (particularly the former), and construction and engineering. In each of the latter cases, suitably qualified individuals were in scarce supply as their 'home' industry currently had demand for them with better reward than could be supplied in teaching. No specific alternatives were proposed other than mutual promotion of the value of this work and opportunities that were available.

Thus, there maybe merit in the SCR facilitating opportunities for shared recruitment processes, or brokering 'staff sharing' schemes, where relationships and proximity permit.

5.4 Employer Engagement and Links

All of the providers had strong links with employers both at senior and curriculum management level. The 'normal' pattern was for the senior staff including the CEO/Principal to engage with their equivalent or senior staff in large firms or with national level organisations to form links and for client liaison purposes. Mid-level managers were expected to form links to manage delivery. There appears to be a correlation between strong apprenticeship provision and the extent of employer links.

5.5 Apprenticeship Levy

We explored the introduction of the Apprenticeship Levy on the colleges' planning processes looking, in particular, as to whether it was likely to result in a significant change in provision. Almost all the providers consulted stated that the Levy was having no impact at present and that the uncertainty around the initiative meant that it could not be effectively planned for. In one provider, there had been a shift, recognising that large employers might seek a different or more specialised form of delivery and therefore they were seeking to recruit more specialised sessional staff for shorter interventions. In another, there had been significant senior management investment in developing links with a number of large employers which was likely to lead to opportunities for apprenticeship delivery. Most, but not all, providers were seeking to use their own levy funding to support their own apprenticeship programmes. Overall, there was seen to be a degree of uncertainty and confusion in the process which hampered effective planning.

5.6 Skills Bank

As part of our consultation exercise, we asked as to the extent that the colleges worked with the Skills Bank (SB). The Skills Bank was established by the SCR as a mechanism for improving the skills base of the local labour force and to 'place purchasing power in the hands of employers'

The overwhelming feedback was that the colleges had a generally neutral, or negative, view of the initiative (though we did note that the RNN Group has a dedicated SB webpage). When pressed the reason appeared to be that the SB was viewed as too bureaucratic with too many steps involved in securing what was often described as small amounts of provision. We were not able in the time available to test this further and we are also aware that there is a view that the colleges do not engage effectively with the unit while private providers do.

It maybe that the colleges, because of their size, give less priority to the work available through the SB, it may equally be that given the need to maximise efficiency elsewhere that they lack the ready resource to meet the needs identified in a timely fashion. It maybe that we spoke to managers at too high a level of seniority. Whatever the reason, we believe it worthwhile continuing to explore with appropriate level managers in the providers in scope how the opportunities available through the SB can be accessed and how any barriers, real or perceived, can be overcome. It may be worthwhile, for example, using the SB to target priority occupations and needs as identified in this report within a mechanism specifically agreed with the In-Scope providers and in doing so, seek to overcome the barriers they perceive to lie in the process.

5.7 Careers Advice and Guidance

As part of our consultation exercise we sought to identify what form of careers advice was offered within a number of the providers interviewed. All had some form of dedicated resource ranging from a member of staff with oversight of the provision to a dedicated function. LMI is used to inform the service but this took a variety of forms.

We did note the significant impact that the HEIs had in terms of shaping the offer and therefore the pathways provided in schools, but the intelligence gathered by the HEIs and the way that shapes their offer aspect of the information that should be available to learners considering progression pathways.

We were also able to meet with the lead consultant for the SCR on Careers, advice and guidance and reviewed the SCR CEIAG Strategy currently under development.

We noted the concerns raised regarding the fragmentation of the careers service as follows:

The SCR Strategy identifies that since the responsibility for delivering careers guidance transferred to schools in 2012 and the national cessation of funding for work related learning in 2010, the infrastructure for delivering CEIAG to young people in the region had materially diminished. In SCR, there are pockets of good practice yet the range of CEIAG providers and the number of funders for both adults and young people is at best fragmented and at worst bewildering. The local mapping identified at least 11 providers of career development support

for young people alone; quality benchmarking is confused by disparate; though improving national guidance on professional Careers Guidance; and multiple funding streams, ranging from local purchasing from schools, service commissioning at Local Authority level, and national funding competitions add to a challenging picture of provision.

The Strategy aims to address some of the fundamental CEIAG issues within the region.

The project team fully support the aims of the Strategy. The opportunities identified in the review are key to both the region and to its residents. We believe success in these areas will help to ensure that individuals are aware of the opportunities that are available provided that the relevant LMI data is robust, readily available, and usable by a range of key partners.

Our review has highlighted:

- There is scope to use the outputs of the wider curriculum review to inform the development of robust LMI data which can then be used both by providers and also by those giving advice to both young people and adults. This was backed up as part of our testing of the curriculum planning tools developed. Managers stated that the information provided by the tools would be a major support for the career guidance function within their Colleges
- That it is vital that the various development pathways including apprenticeships, advanced learner loans and HE within FE are understood by those charged with providing careers advice, and guidance.
- The importance of the HEIs role in providing intelligence regarding the needs of employers and the impact on their offer
- Genuine Employer engagement with SFCs and Colleges in providing information and support to aid effective curriculum development is key.

Finally, we believe that there should be a close focus on the advice that is given to adults given the issues with advanced learner loans, the limited ASB budget, and the 'problems' of HE loans for older workers.

5.8 SWOT Analysis of the In-scope Providers Interviews

The next sections summarise the outcomes of the in-scope Providers interviews under strengths, weaknesses, opportunities and threats

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • The vast majority of colleges use robust LMI data and other sources of information to drive the planning of curriculum to meet local and strategic needs • Colleges have a history of being responsive to meet the needs of the local community • Colleges have longevity and therefore should be viewed as a major strategic partner 	<ul style="list-style-type: none"> • Short term planning horizon of only 12 months results in Colleges unable to plan for the long term and deliver on some of the key strategic objectives of the SCR • Lack of specialist resources could result Colleges unable to deliver the higher level qualifications currently required in the SCR. • Poor use of the Skills Bank by Providers results in missed opportunities to develop the skills of people within the region • Inability to recruit and retain specialist staff results in the inability to deliver STEM qualifications
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • There is a potential to develop the role of the HEI's, using their market assessment and links to employers to further improve the planning process • Opportunities to further build links between HEI's, GFE's and SFC's to develop progression from level 3 to higher level qualifications to increase the higher level skills within the region. • Colleges are open and willing to form alliances where it makes sense in terms of risk and reward – for example in the investment of resources. • To look into the opportunities that will be available to Colleges to further develop their specialist facilities through the launching of the DfE Institute of Technology initiative. 	<ul style="list-style-type: none"> • The continued trend towards the joining of MATs results in SFC's becoming more distant from the operational requirements of the SCR as it focuses on the priorities of the MAT • The insolvency regime regulation makes College more risk adverse and therefore planning and investment is impacted on negatively • Lack of stability in government funding results in a continued lack of investment in specialist facilities and resources to deliver the requirements of the new standards. This could be further compounded by banks reluctance to invest/loan to the sector • Lack of continued clarity around the apprenticeship levy resulting in poor forward planning

6.0 Supply and Demand

6.1 Analysis by In-Scope Providers

The review also undertook an analysis of the supply and demand information, alongside forecast trends across the SCR economy and labour market to 2022, to identify options for prioritisation of supply development for each of the 21 Priority STEM Occupations for consideration by the SCR and its partners.

The coding provides an indicative assessment of opportunities (related to the number of job opportunities - new and/or replacement - and trends in delivery in FE and HE). Opportunities are identified in green if the trend figures for jobs and supply show there has been a growth in demand since 2013/14 and there is continued substantial delivery in the area. Orange shows some opportunities given that there is some existing delivery and demand is being maintained. Red covers areas where there is existing low levels of delivery and employment trends suggest a relatively lower number of job opportunities (new or replacement).

The supply and demand matrices are intended to encourage discussion around where further developments might be warranted and it may be the case that some 'Red' opportunity areas are targeted to provide new opportunities with an improved geographical spread across the SCR given the localised market most providers currently have.

The findings of this analysis are illustrated in summary in the tables over the following pages, and described in detail in the Supply and Demand Matrices that accompany this document in Appendix. Recommendations for the prioritization (high, medium and low) can be found in Section 9 – Recommendations.

SCR Review – Demand and Supply Review Matrix - Overview Summary - Higher Priority Needs

Occupation	Barnsley		Chesterfield		Doncaster		RNN Group		Sheffield		Sheffield Hallam		Uni of Sheffield		CITB		ESG		JTL		Dearne Valley		Brinsworth	
	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O
2136 Programmers and Software Development Professionals - Higher Priority to extend availability and address lower level of supply, plus support for 16-19 vocational delivery.	Red	Red	Red	Red	Red	Red	Red	Red	Yellow	Yellow	Green	Green	Yellow	Yellow	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
3113 Engineering Technicians- Higher Priority to maintain and enhance in line with potential significant vacancy levels.	Yellow	Yellow	Green	Green	Green	Green	Yellow	Yellow	Green	Yellow	Green	Green	Green	Green	Red	Red	Red	Red	Green	Green	Red	Red	Green	Yellow
3131 IT Operations Technicians - Higher Priority to extend availability and address lower level of supply, plus support for 16-19 vocational delivery.	Red	Red	Red	Red	Red	Red	Red	Red	Yellow	Yellow	Green	Yellow	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
5223 Metal Working Production and Maintenance Fitters Higher Priority to maintain and sustain higher levels of employment and critical role in advanced metals manufacturing.	Green	Yellow	Green	Green	Green	Green	Yellow	Yellow	Green	Yellow	Green	Yellow	Green	Green	Green	Green	Red	Red	Green	Green	Red	Red	Green	Yellow
5231 Vehicle Technicians, Mechanics and Electricians - Higher Priority to maintain and sustain higher levels of employment.	Green	Yellow	Green	Green	Green	Green	Yellow	Yellow	Green	Yellow	Green	Yellow	Green	Green	Yellow	Yellow	Red	Red	Green	Green	Red	Red	Green	Yellow
5241 Electricians and Electrical Fitters - Higher Priority as there is recent demand growth at Apprenticeship and Adult Skills level to facilitate, and significant employer.	Green	Yellow	Green	Green	Green	Green	Yellow	Yellow	Green	Yellow	Green	Yellow	Green	Green	Green	Green	Red	Red	Green	Green	Red	Red	Green	Yellow

SCR Review – Demand and Supply Review Matrix - Overview Summary - Medium Priority Needs

Occupation	Barnsley		Chesterfield		Doncaster		RNN Group		Sheffield		Sheffield Hallam		Uni of Sheffield		CITB		ESG		JTL		Dearne Valley		Brinsworth	
	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O
2129 Engineering Professionals nec - Medium Priority to maintain provision.																								
3111 Laboratory Technicians - Medium/Low Priority to identify new qualification route in FE supply in SCR.																								
3122 Draughtspersons - Higher/Medium Priority to maintain and enhance.																								
5215 Welding Trades - Medium Priority to maintain and sustain higher levels of employment and critical role in advanced metals manufacturing.																								
5221 Metal Machining Setters and Setter-Operators Medium Priority to maintain and sustain higher levels of employment.																								
5249 Electrical and Electronic Trades nec - Medium priority to support recent growth in supply delivery.																								
5250 Skilled Metal, Electrical and Electronic Trades Supervisors - Medium Priority to support Apprenticeship growth area.																								
5314 Plumbers and Heating and Ventilating Engineers - Medium Priority to support growing construction demands, specialist facilities may be required.																								
5319 Construction and Building Trades nec - Medium Priority given level of replacement demand, though limited to narrow range of providers at present.																								

SCR Review – Demand and Supply Review Matrix - Overview Summary - Lower Priority Needs

Occupation	Barnsley		Chesterfield		Doncaster		RNN Group		Sheffield		Sheffield Hallam		Uni of Sheffield		CITB		ESG		JTL		Dearne Valley		Brinsworth	
	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O	D	O
2133 IT Specialist Managers - Lower Priority to extend availability and address lower level of supply, plus support for 16-19 vocational delivery, but potential employment demand low.																								
2139 Information Technology and Telecomms Professionals nec - Lower Priority to extend availability and address lower level of supply, plus support for 16-19 vocational delivery, but low employment demand expected.																								
3119 Science, Engineering and Production Technicians nec- Lower Priority to maintain and enhance.																								
3132 IT User Support Technicians - Lower Priority as private sector very strong for this occupation, some options for 16-19 vocational delivery.																								
5315 Carpenters and Joiners - Lower Priority as overall employment due to fall and annual employment demand low.																								
5330 Construction and Building Trades Supervisors - Lower Priority given level of replacement demand, though limited to narrow range of providers at present.																								

6.2 Analysis of Supply and Demand by Occupation (numbers)

The tables below show an analysis of supply and demand of the 21 priority occupations in SCR.

Demand shows an overall estimate on where key levels of employment demand on an annual basis are likely to be to 2022. Shading shows Red under 300 per annum; Orange shows Up to 600; Green shows Over 600 per annum.

- Supply provides an indicative assessment against occupations against the estimated existing numbers of learners. Red: Lower Supply; Orange: Medium Supply; Green: High Supply.
- The supply and demand matrices have been revised in line with the assessment on Demand and Supply as above. Those occupations in Green show higher priority areas; Orange are medium priorities; Red - lower priorities for the consideration of supply enhancement or development for the reasons identified against each occupation.

The overall matrices take account of the employment picture and estimated employment demand plus the prospects for the occupations and the key sectors those roles will be found in. A broad assessment of supply levels including trends in delivery at in scope providers. This then identifies a series of indicative areas where SCR should consider supply developments in line with the assessed employment patterns.

6.2.1 Demand

Occupation	New jobs to 2022 (A)	Replacement to 2022 (B)	Total New & Replacement to 2022 (A+B)	Total Annual Demand to 2022 (A+B/5) = (E)	Vacancies 2016 (F)	Total Annual Demand (E) + (F)	Range of Estimated Annual Demand
Engineering professionals	52	251	303	61	405	466	400-500
Engineering Technicians	45	249	294	59	1,070	1,129	1,000-1,200
Metal Working and Production & Maintenance Fitters	40	1334	1374	275	677	952	900-1,000
Science Engineering and Production Technicians	34	211	245	49	795	844	800-900
Metal Machine Setters & Setter Operators	-175	579	404	81	338	419	400-500
Skilled Metal, Electrical and Electronic Trades Supervisors	34	254	288	58	24	82	c.100
Laboratory Technicians	114	404	518	104	295	399	300-500
Welding Trades	-34	452	418	84	431	515	400-600
Vehicle Technicians, Mechanics and Electricians	442	648	1090	218	1,084	1,302	1,200-1,400
Draughtsperson	29	178	207	41	265	306	300-400
IT User Support Technicians	125	159	284	57	1,644	1,701	1,600-1800
IT Operations Technicians	105	208	313	63	1,099	1,162	1,000-1,200
IT Specialist Managers	168	428	596	119	32	151	100-200
IT & Telecoms Professionals	162	254	416	83	56	139	100-200
Programmes and Software Development Professionals	268	320	588	118	316	434	400-500
Construction and Building Trades	106	474	580	116	71	187	100-300
Construction Supervisor	179	415	594	119	7	126	100-200
Electrical and Electronic Fitters	289	913	1202	240	877	1,117	1,000-1,200
Electrical and Electronic Trades nec	112	341	453	91	890	981	900-1,100
Plumbers and Heating and Ventilation Engineers	299	309	608	122	423	545	400-600
Carpenters and Joiners	-5	383	378	76	107	183	100-300

EMSI data supplied by SCR

6.2.2 Supply

Occupation	Apprenticeships		Advanced Learner Loans		Adult Skills Budget		Overall FE Supply Assessment	HE In Scope	Overall HE Supply Assessment
	SCR Residents	In Scope	SCR Residents	In Scope	SCR Residents	In Scope			
Engineering professionals	3,180	1,890	60	40	170	150		8,900	
Engineering Technicians	3,220	1,900	60	50	200	170		8,900	
Metal Working and Production & Maintenance Fitters	3,600	2,210	60	50	190	170		8,900	
Science Engineering and Production Technicians	40	10	40	30	120	90		19,370	
Metal Machine Setters & Setter Operators	3,220	1,900	60	50	220	170		9,410	
Skilled Metal, Electrical and Electronic Trades Supervisors	3,160	880	60	40	200	160		9,040	
Laboratory Technicians	3,410	2,180	40	30	150	130		7,140	
Welding Trades	3,100	1,920	60	50	180	160		6,740	
Vehicle Technicians, Mechanics and Electricians	3,110	2,110	100	70	310	250		6,000	
Draughtsperson	500	80	60	40	200	150		5,610	
IT User Support Technicians	500	80	60	40	200	150		5,610	
IT Operations Technicians	580	80	60	40	170	130		5,590	
IT Specialist Managers	500	80	60	40	170	130		5,580	
IT & Telecoms Professionals	1,190	880	60	40	140	130		4,380	
Programmes and Software Development Professionals	1,220	880	60	30	100	90		4,370	
Construction and Building Trades	3,360	2,160	70	40	180	160		4,170	
Construction Supervisor	1,230	890	50	30	110	100		2,590	
Electrical and Electronic Fitters	500	340	10	10	10	10		4,380	
Electrical and Electronic Trades nec	580	80	60	40	160	120		5,550	
Plumbers and Heating and Ventilation Engineers	3,360	2,160	70	40	180	160		4,170	
Carpenters and Joiners	3,610	2,210	90	60	250	210		4,490	

HESA 2015/16 data and 2015/16 National ILR R14 (Numbers rounded to the nearest 10)

6.3 Summary of Supply and Demand

Reviewing existing supply and demand information, alongside forecast trends across the SCR economy and labour market to 2022, we identify the following options for prioritisation of supply development for consideration by the SCR and its partners. These are illustrated in summary in the tables in the previous pages, and described in detail in the Supply and Demand Matrices that accompany this document.

Higher Priority Areas		
Occ Code	Occupation	Comment
2136	Programmers and Software Development Professionals;	To extend availability, address lower level of supply, and support key routes for the engagement of 16-19 year olds not undertaking academic routes of study in their early years of post-16 education.
3131	IT Operations Technicians	
3113	Engineering Technicians;	To maintain and sustain higher levels of employment and critical role in advanced metals manufacturing
5223	Metal Working Production and Maintenance Fitters	
5231	Vehicle Technicians, Mechanics and Electricians	To maintain and sustain higher levels of employment.
5241	Electricians and Electrical Fitters	To support recent demand growth at Apprenticeship and Adult Skills level to facilitate, and a significant employer.
Medium Priority Areas		
Occ Code	Occupation	Comment
2129	Engineering Professionals nec;	To maintain and enhance important existing provision related to key needs of metal manufacturing.
3122	Draughtspersons	
3111	Laboratory Technicians	to identify new qualification route in FE supply in SCR.
5215	Welding Trades and	Operators to maintain existing employment levels but potential future employment needs are lower than for other occupations.
5221	Metal Machining Setters and Setter	
5249	Electrical and Electronic Trades nec	To support growing supply developments.
5250	Skilled Metal, Electrical and Electronic Trades Supervisors	
5314	Plumbers and Heating and Ventilating Engineers	To support growing construction demands, but specialist facilities will be required.
5319	Construction and Building Trades nec	To support replacement demands, though limited to narrow range of providers at present.
Lower Priority Areas		
Occ Code	Occupation	Comment
2133	IT Specialist Managers	Lower potential employment demands.
2139	Information Technology and	

	Telecomms Professionals nec	
3119	Science, Engineering and Production Technicians nec	Areas of lower potential employment.
5315	Carpenters and Joiners	
5330	Construction and Building Trades Supervisors	
3132	IT User Support Technicians	As the private sector offers very strong delivery for this occupation at present, although there are options to support the engagement of 16-19 year olds not undertaking academic routes of study in their early years of post-16 education.

7.0 Quality of Provision

This section provides a summary of the quality of STEM provision delivered by in scope providers in the SCR Region. Appendix 10 shows the detail behind this summary.

7.1 Inspection Results

Provider UKPRN	Provider name	Date published	Overall effectiveness	Outcomes for learners	Quality of teaching, learning and assessment	Personal development, behaviour and welfare	Effectiveness of leadership and management	Difference from Previous Inspection
10001436	CITB-ConstructionSkills	09/01/2013	1	1	1		1	Improved
10036952	GP Strategies Training Ltd*	24/08/2012	2	2	1		1	Stayed the Same
10003526	JTL	05/01/2017	2	3	2	2	2	Stayed the Same
10034309	ESG (Skills) Limited	20/01/2014	2	3	2		2	Not Applicable
10000536	Barnsley College	06/01/2011	1	1	2		1	Improved
10002005	Doncaster College	20/05/2016	2	2	2	2	2	Stayed the Same
10005534	RNN Group	27/06/2013	2	2	2		2	Improved
10006892	Thomas Rotherham College	19/02/2014	2	2	2		2	Improved
10005788	The Sheffield College	24/02/2016	3	3	3	3	3	Declined
10001378	Chesterfield College	11/11/2013	2	2	2		2	Stayed the Same
10008655	Longley Park Sixth Form College	18/11/2015	2	2	2	2	2	Improved
10007157	University of Sheffield							
10022320	Brinsworth Training Limited	30/11/2016	3	3	3	3	3	Stayed the Same
10001897	Dearne Valley College							
10005790	Sheffield Hallam University							

7.2 Quality by Curriculum Provision

7.2.1 16-18 Classroom based provision – Achievement Rates

	National Average %	In-scope provider Achievement Range %	No. of providers falling below the national average
Health and Public Services	85	73.8-94.5	3/8
Engineering and Manufacturing	83	78.6-94	2/7
Construction and The Built Environment	80	78.6-81.3	2/5
ICT	87	81.1-94.5	1/8

Overall achievement rates for the high level classifications that cover the priority occupations are a reasonable indicator of performance given that it is beyond the scope of this report to do analysis by individual qualifications. We can see that the majority of providers are above the national average but not all. A further analysis is required to review those falling below the threshold and the reasons for the shortfall.

7.2.2 A-Level Quality

In respect of A-Level provision the most recent DfE statistics show that only one in-scope provider delivering significant volumes has a positive value-added score of 0.03

Destination Data

Destination data shows the percentage of 16,17 or 18-year-old students continuing to a sustained education or employment destination in the year after completing 16 to 18 study (after A-Levels or other level 3 qualification)

Destination data linked specifically to the in-scope providers and STEM subject areas highlights the following findings:

Full Level 3

- Sustained Positive Destination Rate for all subject areas was 85%
- In relation to STEM the range was between 80-90%.
- The rate was lowest in the subject areas of Construction, Planning and the Built Environment (80%) and ICT (82%)
- Engineering and Manufacturing Technologies had the highest % at 90%
- The range remained consistent across the City Regions
- In-scope providers had a range between 81% and 91-100%. With 4 providers following below the overall destination rate of 85% (the lowest % rate was 81%)

7.2.3 Apprenticeships – Achievement Rates

SSA	National Average %	Achievement Range for in-scope providers %	No. of in-scope providers falling below the national average
16-18 Advanced Level Apprenticeships			
Health and Social Care	67.9	50.0-83.3	1/5
Engineering	65.6	40.0-92.9	3/5
Manufacturing Technologies	75.8	54.5-100	5/8
Building and Construction	73.9	10.0-85.7	2/5
ICT Practitioners	76.9	80.0	0/1
ICT Users	80.0		
19-23 Advanced Level Apprenticeships			
Health and Social Care	63.7	50.0-79.3	1/6
Engineering	69.5	50.0-80.0	2/6
Manufacturing Technologies	77.5	44.4-83.3	6/8
Building and Construction	77.0	66.7-92.9	1/4
ICT Practitioners	78.3	86.7-100	0
ICT Users	76.8		
24+ Advanced Level Apprenticeships			
Health and Social Care	65.1	63.4-79.2	1/5
Engineering	64.2	40.0-100	1/4
Manufacturing Technologies	70.8	87.5-100	0/2
Building and Construction	68.7	84.0	0/1
ICT Practitioners	80.6		
ICT Users	70.6	80.0	0/1

Overall, the results show a mixed picture though we would point out that those areas in engineering and manufacturing technologies which are below the national benchmarks. This requires further exploration to understand the reality behind the numbers, whether this is a continuing issue, and what steps are being taken by the provider to resolve the position where there is a genuine point of concern.

Destination Data - Apprenticeships

- Sustained Positive Destination Rate for all subject areas was 90%
- In relation to STEM the range was between 90 and 91-100%.
- The rate was lowest in the subject area of ICT (90%)
- In-scope providers had a range between 83% and 91-100%. With 2 providers following below the overall destination rate of 90% (the lowest % rate was 83%)

8.0 STEM Level 3 Review Outputs

This section details the Planning Tools that were developed and data analysis outputs for providers as part of this Review.

8.1 Curriculum Planning Tools

The following tool were developed for use by either the SCR at top level or by the inscope providers:

1) **Priority STEM Occupation Review Tool** - this tool maps the SCR priority occupations across Standard Occupational Classifications (SOCs) 21, 31, 52, and 53 providing extended detail on the definition of these jobs that the SCR has identified as areas of employment where significant increases are likely to be noted to 2022 and beyond. Appendix 1

2) **Apprenticeship Curriculum Planning Tool** - it is intended that this tool aids providers across the SCR area to review existing Apprenticeship provision at Level 3 and above to identify existing opportunities and those that are likely to emerge given the changes to be seen in the 21 priority STEM -related occupations to 2022. It focuses on Apprenticeships because these account for the largest share of Level 3+ supply across all Priority STEM occupations in the SCR area or alternatively because of the policy emphasis in this area over recent years. This tool is intended for use by College staff to provide a detailed overview to support curriculum planning activities. Appendix 2

3) **The Overall SCR and College Gap Analysis Template** - this document outlines the key strategic components required to further support curriculum planning, and to highlight where there is a perceived critical gap between the known baseline position for a higher level STEM curriculum that meets the projected new employment demands and/or where we believe there is an existing good strategic fit. It provides critical context for the forecasting work required in the next element of the review work. Appendix 3

4) **Apprenticeship Forecasting Tool** - this tool aims to assist in the forecasting of pipeline demand in new standards for Higher Level STEM Apprenticeships that aids the identification of existing baseline supply and potential growth demand for specialist classroom qualifications and assessments for the new standards. It aims to support planners in identifying the impact of these trends on facilities, resources and classroom requirements and any potential capital investment needs that may arise from them. Appendix.4

5) STEM Planning and Forecasting Tool

Our testing of the planning and forecasting tools has enabled us to establish 'worked examples' for Colleges and Providers to review their existing STEM apprenticeship baselines against the new and replacement jobs forecasts in each priority occupation, to assess how their provision can best meet these future skills demands, and the strategic fit with new Apprenticeship Standards in these occupational sectors.

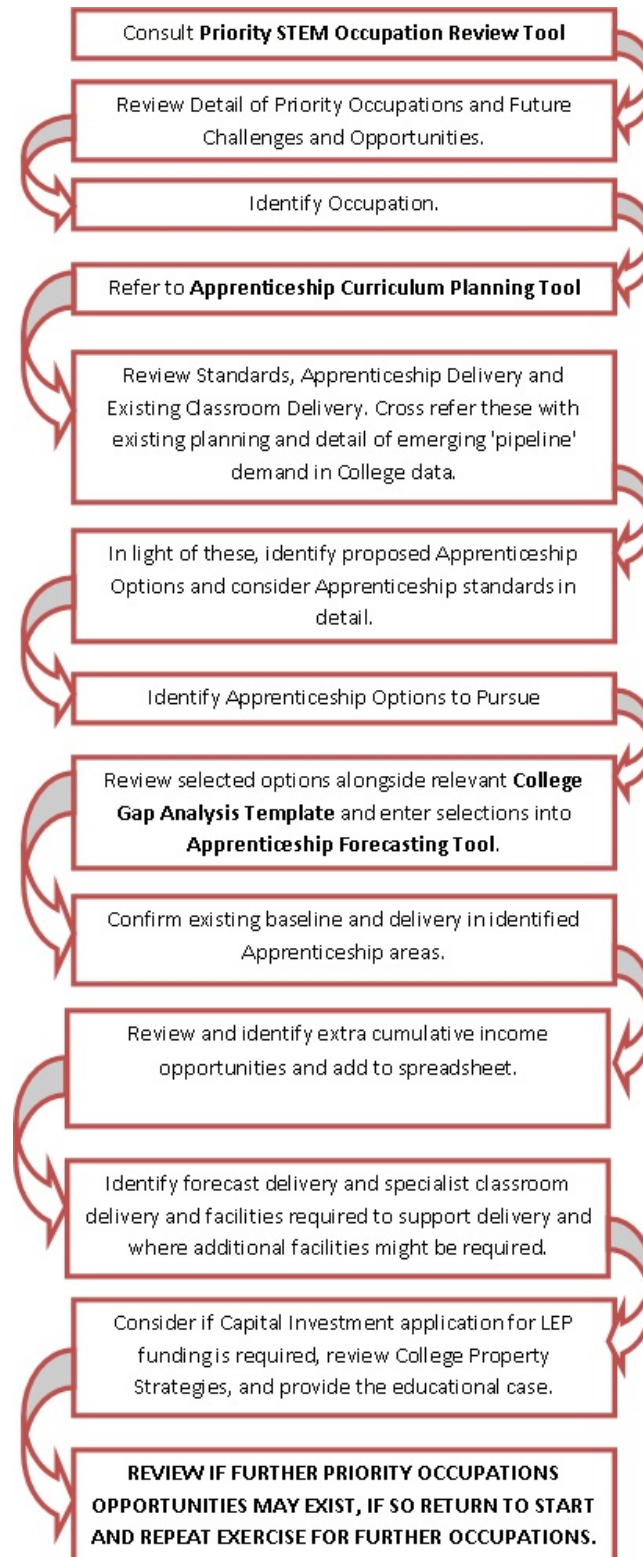
The following example shows how one existing College framework in Vehicle Maintenance

and Repair maps to the new standards in higher level STEM and identifies some future opportunities for growth. This illustrates one way in which in-scope providers can seek to review their existing, and future options for, provision in line with the needs of the 21 Priority STEM occupations, which represent the key future growth areas of STEM in the SCR area.

5321 Vehicle Technicians, Mechanics, Electricians
Example Job Roles: Auto electrician; Car mechanic; HGV mechanic; Technician (motor vehicles); Manufacturing Engineers
<p>Significant New Apprenticeship Standards Available:</p> <ul style="list-style-type: none"> • Transport Planning Technician Apprenticeship Level 3; • Rail Engineering Technician Level 3; • Rail Engineering Advanced Technician Level 4; • Accident Repair Technician Level 3. <p>All New Standards are ready to use.</p>
<p>New Opportunities for Classroom Delivery for new standards:</p> <ul style="list-style-type: none"> • Higher Apprenticeship in Control / Technical Support Engineering Apprenticeship Standard requiring HND or Foundation Degree. • Rail Engineering Advanced Technician New Qualifications (in development): Level 4 Rail Engineering (Competence and Technical)
Existing Apprenticeship Delivery: 20/280 SCR Residents – Vehicle Maintenance and Repairs.
STEM Economic Investment Developments: Home to international distribution firms such as Amazon, ASOS and TNT, and has A1/M1 connections, East Coast and Midland Mainlines, and international Robin Hood airport; £210m Government investment in the SCR Infrastructure Fund; Doncaster iPort Transport Hub; National College for High Speed Rail; and Research Centre for Advanced Automotive and Aero Mate

8.2 Application of the Planning Tools

The flow chart below illustrates how the Curriculum Planning Tools that have been developed can be used within a curriculum planning environment:



8.3 Provider Outputs

As part of the STEM Level 3 Review RCU compiled the following reports for each Provider:

Output	Contents	Content Detail
STEM Report	<ul style="list-style-type: none"> Apprenticeship Analysis Advanced Learner Loans Analysis (ALL) Adult Skills Budget (ASB) Higher Education (HE) 	Top Frameworks
		Trends
		% by Level
		No. by age band
		% by deprivation
		% by Occupation Course Category
		No. by District
		Prior Attainment Analysis
		Breakdown of App by Occupation
		Travel to Learn Analysis

8.4 Data Analysis Outputs

As part of the review the following detailed data reports were also produced by RCU. These reports were used to analyse the current position of STEM Level 3 in the SCR and from which the findings in Section 4 were derived from:

Output	Contents	Content Detail
STEM Level 3 Data Overview for SCR	<ul style="list-style-type: none"> Apprenticeship Analysis Advanced Learner Loans Analysis (ALL) Adult Skills Budget (ASB) Higher Education (HE) 	Top Frameworks
		Trends
		% by Level
		By Provider Type
		By Provider
		By Age Band
		By Deprivation
		By Provider Group
		By Occupation Category
		Prior Attainment Analysis
Occupation Report for each of the 21 priority occupations in review	<ul style="list-style-type: none"> Apprenticeship Analysis Advanced Learner Loans Analysis (ALL) Adult Skills Budget (ASB) Higher Education (HE) 	Top Frameworks
		Trends
		% by Level
		By Provider Type
		By Provider
		By Age Band
		By Deprivation
		By Provider Group
		By Occupation Category
		Prior Attainment Analysis
Breakdown by Occupation		

		Travel to Learn Analysis
16-18 Data Tables	By SSA1 and SSA2 <ul style="list-style-type: none"> • Learners Rounded • Enrolments Rounded • Weighted Enrolments Rounded 	3 year analysis from 2013/14 broken down by: <ul style="list-style-type: none"> • Inscope Providers • Other Colleges • Other Sixth Form Colleges • Other Private Training Providers • Other Public Funded i.e LA's • School Sixth Forms
16-18 Core STEM Occupation Summary	SOC Code: <ul style="list-style-type: none"> • Tier 2 • Tier 3 	3-year analysis from 2013/14 by Occupation by: <ul style="list-style-type: none"> • Inscope provider • UTC • Other
Quality Data Analysis	• Destinations	Analysis by Provider and Occupation
	• In Year Retention and Pass Rates	Analysis by Provider and Occupation
	• Inspection Results	For each of the Inscope Providers
	• QAR Data	Analysis by Provider and age

9.0 Conclusions

It is not possible to completely predict either the demands of the future economy or the career choices of individuals. Google, Apple and Microsoft are all companies in their 30s. That means that a 16-year-old studying in a college in the SCR could, by the time she is 50, be working for one of the biggest companies in the world, a company that hasn't been founded yet and that sells a product that doesn't exist.

The best we can do is to consider trends and likely areas of over provision or concern.

Our study, has shown in section 5 that there are occupations that are considered high, medium, low priority in terms in terms of action planning.

That said, we must bear in mind that this is a pilot project. We have looked at 'one slice of the pie'. To better assess the picture, we need to look at the 'whole pie'. For example, an individual studying for an IT related qualification may equally choose a career in the Digital or Creative Industries where that qualification gives equivalent access to the relevant degree

Despite all these factors we believe that the tools set out in this report, allied with robust LMI, shared and understood between the parties together with an open and constructive dialogue between the key strategic partners provide the basis for effective planning

10.0 Recommendations

16-19

- In line with the Post 16 Skills Plan the Curriculum Steering Group (CSG) should work to identify the appropriate cluster and occupational groups and identify the progression pathways from school to Higher Technical and undergraduate provision, Apprentices and work as part of its overall supply chain management and as part of its Careers Strategy
- CSG should recognise that school performance at GCSE and especially Maths and English is a core element of the strategy both in terms of ensuring that individuals can access the opportunities that are available to them, as well as removing the inefficiency of Colleges and providers having to do remedial work

Adult Provision

In relation to adult provision the SCR should:

- Use its position as the Combined Authority to pursue changes in the current policy which favours 16-19 provision and apprenticeships over adult education working with other City Regions and other agencies as appropriate
- Take advantage of the £170m capital funding over the next three years to create one or more Institute for Technologies (Iota's) within the SCR and provide investment for specialist equipment to deliver the higher level STEM qualifications. This would require collaborative working with strategic partners. Areas of focus are identified in the high

priority occupations, clustered according to the core qualifications and ideally linked to the technical education routes.

- Carry out further work to review the extent to which full cost provision, commercial training and older adults pursuing 'late' degrees are contributing to the retraining of adult workers
- Consider whether there are additional funding opportunities to support adult retraining including working with Colleges to identify ways in which they are likely to make greater use of the Skills Bank
- Undertake a review of the reasons for the popularity of ALL in health related subject to assess what lessons can be learnt and transferred to the STEM priority areas
- Review the opportunities to develop additional opportunities for Level 4 provision as currently only 10% of provision is at this area.

Apprenticeships

Specifically, in terms of apprenticeships, we would recommend:

- Engagement with the Higher Education Universities to develop specialist STEM partnerships with key inward investment Levy employers for future STEM apprenticeship demand.
- Further work to support combined working amongst providers to deliver Higher Level Apprenticeships should the Apprenticeship Company not be implanted in its original form
- Utilisation of the provider planning tools which have identified the relevant new apprenticeship standards and the fit with the providers existing L3+ apprenticeship delivery profile.
- A review of current facilities to ensure the successful delivery of a new generation of technical based classroom based qualifications in line with the new standards
- The Colleges should explore how they can grow the market in the same way that has been achieved by the private provider basis. If the proposed Apprenticeship Company does not proceed, then it would still be valuable for colleges (and providers) to explore how they can work collaboratively to develop Higher Level apprenticeships in particular.

LMI

- In relation to LMI the SCR should develop a position as the main source of accurate, relevant and accessible LMI data to inform provider planning processes
- Ensure that this aspect is a key element of its CEIAG Strategy to support the recommendation within the recent review that it works to ensure a more consistent approach by the variety of providers that results from the present system.

Planning

- While recognising the value of an autonomous providers, as part of the planning process the SCR should establish a mechanism for reviewing Colleges and other significant providers plans and performance. The following elements could usefully be included:
 - Strategic priorities and plans
 - Quality
 - Financial Performance
 - Capital proposal
 - Employer Engagement
 - Shortfalls

Equally, Colleges and Providers should expect a degree of oversight given their importance to the delivery of regional objectives.

- The SCR and Provider should review the current shortfalls in certain craft based programmes as identified elsewhere in the report
- Investigate the potential for developing the role of the HEIs and of using their market assessments and links to employers in the wider planning process.
- Develop and build on the already strong links between all parties (HEIs, GFE, SFC) to ensure that the maximum potential of these relationships is realised. This would also apply to progression for learners on level 3 programmes in FE colleges too,
- A future discussion should take place with Colleges to explore whether to, and how they wish, to specialise in light of emerging demands
- There should be a common annual review of regional provision which is conducted through the CSG or equivalent to feed into provider business planning considerations by SCR and Colleges and inform capital requirements.
- The CSG should actively consider how the high, medium, and lower priority proposals for supply development related to the 21 Priority STEM occupations might be addressed over the short, medium and long term, and identify a mechanism through which identified approaches will be kept under review.

Skills Bank

- Exploring with relevant managers in the providers in scope how the opportunities available through the SB can be accessed and barriers, real or perceived can be overcome

Careers

- The Curriculum Steering Group (CSG) should facilitate close collaborative working between the HEIs, GFEs, SSC, School Rep Bodies and Career Advisory Service working

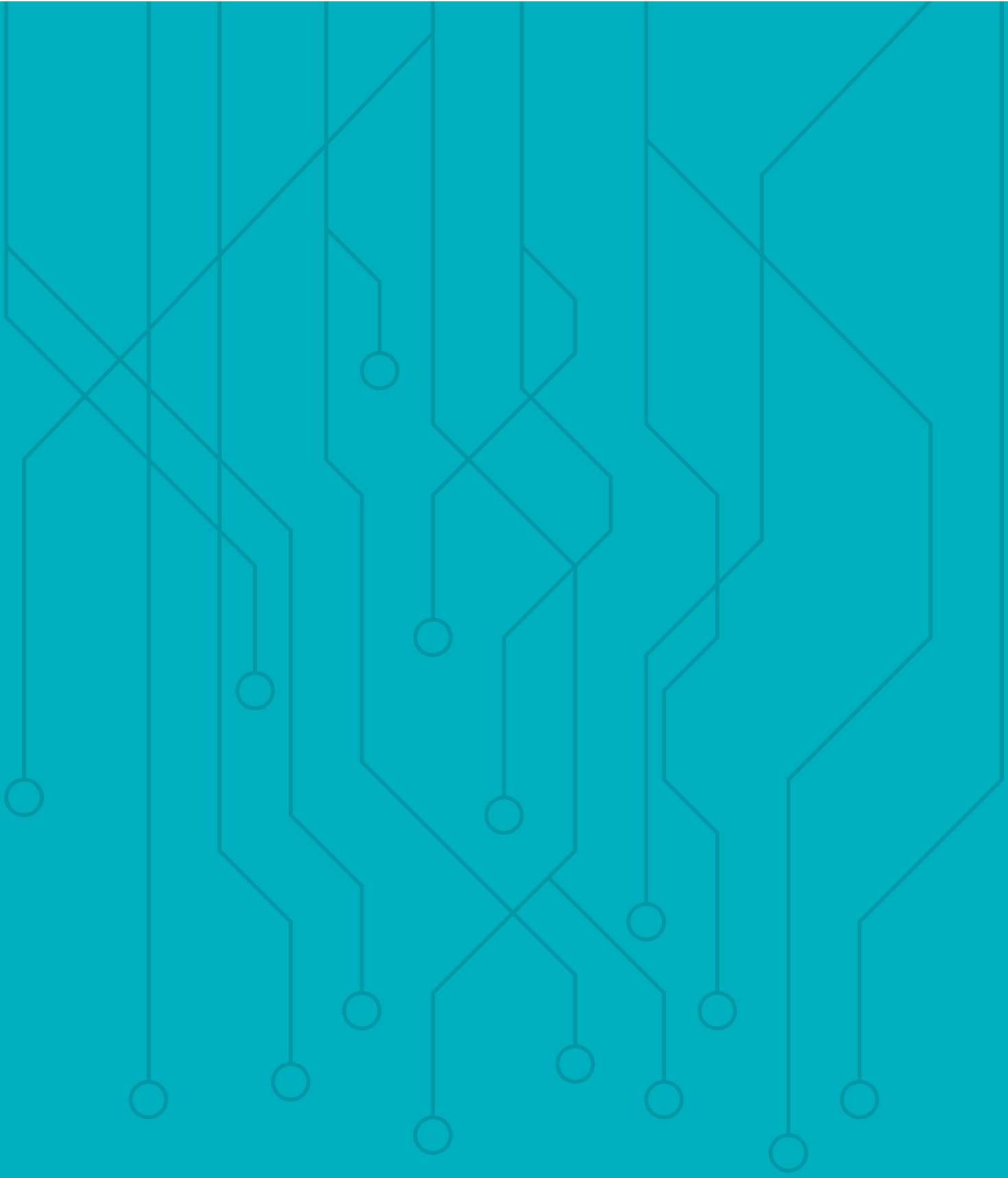
alongside relevant employers to flag career routes into areas of significant demand, particularly related to the 21 Priority STEM Occupations

Human Resources

- Investigate the merit of the SCR facilitating opportunities for shared recruitment processes, or brokering 'staff sharing' schemes where relationships and proximity permits

Capital Investment

- Following a review of the report and its findings, the SCR should work with the Colleges in their role as key strategic partners to define the core priorities of a regional capital investment strategy
- Based on the provisional SCR Gap Analysis and Demand and Supply Matrix, which have assessed the baseline position for higher level STEM skills, the economic inward investment in priority STEM skills, and the known demands for new highly skilled and specialist STEM jobs in the future; it is recommended that the emerging key priorities for Capital Investment will be to:
 - **Consolidate and strengthen the existing specialist Core STEM delivery** where there is a match between the existing supply of priority Core STEM skills, and the forecast for growth in demand for this priority STEM provision.
 - **Assess the capacity for these 'lead' centers** to provide this potential growth in numbers required over the next five years, the space utilization this will require, together with new classroom and specialist equipment requirements.
 - **Create a networked model and/or clusters of STEM higher-level specialist centers**, which will avoid duplication in planning and developing the future supply chains with employers.
 - **Develop a shared facility model**, which will be adaptable and flexible for different aspects of the post 16 STEM curriculum offer.
 - **Develop a major opportunity for Capital Investment** that could not only create the modernised environment for higher level skills in Further Education for new Apprenticeship Standards, in partnership with leading SCR employers, but also share these facilities to help drive demand for these same STEM qualifications.
- Based on the analysis of demand in the priority occupation groups and taking into account the resource requirements that the curriculum demands then, it is recommended that the priority occupations for capital bids are:
 - Engineering Professionals, Technical support and related occupations
 - Metal Trades including machine setters, setter operators, metal working production
 - Electricians and electrical and electronic trades
 - IT systems support
 - IT and Lab Technicians
 - Construction including Joinery
 - Vehicle Technicians mechanics and electrical



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