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Investing in a Smart, Sustainable and Inclusive Future

Graduate Apprenticeships

Framework document for

Data Science at

SCQF level 10

August 2018

Document control

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Terms and abbreviations

Term	Meaning
SDS	Skills Development Scotland
GA(s)	Graduate Apprenticeship(s) / Apprentice(s)
SCQF	Scottish Credit and Qualifications Framework
TEG	Technical Expert Group
IPR	Intellectual Property Rights
GDPR	General Data Protection Regulation
Data Lineage	The flow of data from its source to its destination from a technical point of view.
Data Provenance	The flow of data from its source to its destination from a business point of view.

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Contents

1. Graduate Apprenticeships in Scotland

1.1 Purpose of the Graduate Apprenticeship framework document

The purpose of this document is to provide employers and learning providers with information required to deliver a Graduate Apprenticeship in **Data Science**. The framework sets out the skills and learning outcomes identified through employer consultation that are required to support the development of this programme.

This framework document should be read in conjunction with the following publications:

1. Work-based Learning Principles
2. Product Specification at **SCQF level 10**
3. Quality Assurance Guidance

This documentation is available on the Skills Development Scotland (SDS) corporate website:

www.skillsdevelopmentscotland.co.uk

1.2 What are Graduate Apprenticeships?

Graduate Apprenticeships (GAs):

- are accredited work-based learning programmes that lead to degrees or degree-level, professionally recognised qualifications
- are part of the apprenticeship family, supporting the transition into employment by providing work-based learning pathways from Foundation and Modern Apprenticeships to Higher and Graduate Apprenticeships, at SCQF Levels 8 –11
- have been developed as part of the Scottish Government's approach to developing Scotland's young workforce and Skills Development Scotland's work-based learning strategy

1.3 Why do we need Graduate Apprenticeships in Scotland?

International experience demonstrates how degree-level apprenticeships can drive economic growth. We believe this approach can benefit the Scottish economy.

The range of approaches taken in countries including Switzerland and Germany to develop employer-led, work-based learning pathways to learning and employment provide the basis for how Scotland can use work-based learning to improve the operation of the labour market and to deliver economic growth[1]. Skills Development Scotland is now leveraging the development of Graduate Apprenticeships to support this change.

[1] **PWC (2015) Young Workforce' Index: How well are OECD economies developing the economic potential of their young people?**

1.4 Who develops Graduate Apprenticeships?

Graduate Apprenticeships are developed by Skills Development Scotland through consultation with employers, universities, professional bodies and qualification authorities in the form of Technical Expert Groups (TEGs). The TEGs act as advisory groups on behalf of the sector and are based on the current and future skills needs of industry. They advise on the topics and related outcomes that should be included in a framework.

More information about who was involved in the development of this framework can be found in Appendix C.

1.5 Who are Graduate Apprenticeships for?

Graduate Apprenticeships provide a new way into degree-level study for individuals who are either currently in employment or entering employment. GAs are available to employees aged 16 or over.

1.6 Who delivers Graduate Apprenticeships?

Graduate Apprenticeships are delivered by universities in partnership with employers and college learning providers. An up-to-date list of learning providers and the frameworks they offer can be found on www.apprenticeships.scot.

2. Delivery

As Graduate Apprenticeships are work-based degrees, the place of employment is the place of learning. The learning and skills development must be fully integrated into both the **delivery and assessment** of the degrees when part of a Graduate Apprenticeship. This integration can only be satisfactorily achieved by proper planning and design prior to delivery and not by add-on components or ad-hoc modifications.

The authenticity of the programme is shown in the way employers are involved in the design and delivery of the degrees and the way in which work-based learning is positioned as integral to both the learning and the assessment needed for successful completion of the programmes.

GA are designed as full-time programmes. They are not part-time or sandwich courses. Attendance at the place of learning will be agreed between the provider and the employer sending individuals on the programmes. Examples of how this might work are:

- by day release or
- by block release of three or four-week duration, three times per year
- through distance learning with an initial “boot camp or induction”

Fundamentally, most of an individual’s time should be spent in the workplace on directed study.

In designing the degrees to meet the work-based learning requirements of the GA, learning providers must ensure that they also meet the principles and criteria noted here:

Box 1. Principles and criteria

This GA is an **SCQF level 10** work-based degree. All proposed university degree programmes for this GA framework must:

- be **480 credits**
- be based on a partnership between employers and the learning provider
- evidence how the programmes exemplify the work-based learning requirements
- have clear goals and aspirations in support of equality and diversity with appropriate monitoring and other processes in place
- demonstrate how they will ensure that apprentices, upon graduation, will consistently achieve the necessary industry skills, knowledge and competence defined in **Appendix A**
- develop learning through reflection and review of work processes and experience
- meet the requirements to apply for professional body recognition

NB Delivery models based on sandwich years or industrial placement block release are not considered as work-based learning as part of this framework.

The successful delivery of Graduate Apprenticeships depends upon an effective partnership between the apprentice, the employer and the learning provider. This will involve additions to their normal responsibilities for employees, learning providers, and apprentices.

Delivery of the content of the GA will be agreed by the participating learning providers, which may involve delivery of specialist or employer-specific content. Employers should also be closely involved with all aspects of the programme, including the course specification, delivery, and assessment of practical activities.

The learning provider has responsibility for the quality assurance and enhancement of all elements of the programmes but they must adhere to the SDS specified documents referenced in **Section 1** and any additional guidance documentation provided as part of their competitive grant award. Practical activities must make use of the work environment and course content must take account of the technologies used in the apprentice's employment.

Apprentices must have individual learning and training plans. The learning provider and existing employer HR systems should be co-ordinated during the development of the individual learning and training plan to ensure that the required employer contextualisation is effective. Even within a specific employer, there may be apprentices who use differing technologies.

3. Roles and responsibilities

3.1 Role of the employer

Apprentices are employees and subject to the standard terms and conditions applying to all employees.

Employers participating in the Graduate Apprenticeship programme must:

- consider whether a candidate has a reasonable chance of achieving the selected programme during the selection process – this includes not only the course content but the acquisition of wider graduate attributes
- provide agreed information to support the candidate's application to the degree course
- provide apprentices with suitable opportunities for the type of experience in the workplace that will support their learning and skills acquisition
- provide each apprentice with a nominated mentor who must be readily accessible by the apprentice and to the learning provider
- liaise with the learning provider on the content and practical activities in the apprentice's individual learning and training plan
- provide information that will support the individual apprentice and their assessment

3.2 Role of the learning provider

Apprentices are both employed by the employer, as well as enrolled with the learning provider. As such they should have access to the same facilities as any other student.

GA course design and delivery must adhere to the principles detailed in preceding sections and in addition the learning provider must:

- adopt a flexible approach to considering the suitability of candidates by taking account of the portfolio of previous learning and experience an individual brings to the programme – this will include any relevant Foundation or Modern Apprenticeship undertaken – and support best practice in assessing individuals and in gathering evidence from employers where this is required
- liaise with the employer on the content and practical activities in the apprentice's individual learning plan

In addition, the learning provider should liaise with existing employer Training and Development and Quality Assurance (QA) systems to minimise double assessment. Development and meaningful implementation of individual learning plans is an essential component of the GA and assessments should take account of existing evidence wherever possible.

New evidence that directly relates to the workplace may be authenticated by employers or the individual's mentor.

There are a range of different delivery mechanisms, but the integration of knowledge within contextualised learning opportunities must be the overriding factor.

3.3 Possible delivery might include

3.3.1 Delivery of knowledge and understanding content:

- learning provider for the generic and non-employer specific topics
- employer and/or private providers for employer specific topics

3.3.2 Assessment of practical application:

- task specification by learning provider, employer and apprentice
- progress monitoring and assessment by learning provider and employer (may be third party)
- mentoring by employer

3.3.3 Development of personal and business skills:

- specification by employer and learning provider
- delivery by employer (may be third party) and learning provider
- progress monitoring and assessment by employer (may be third party) and learning provider
- mentoring by employer

4. Entry

4.1 Eligibility

- Graduate Apprenticeships are available to new and existing employees of participating employers.
- Candidates must be at least 16 years of age. However, the suitability of an individual for entry onto a GA will be decided by the employer and their learning provider partner.
- Candidates must be resident in Scotland at the start of the Graduate Apprenticeship. In addition to this, their employer's working premises must also be located in Scotland. When applying to become a Graduate Apprentice the individual will be required to satisfy the employer that they have the right to live and work in Scotland.
- Entry requirements are likely to vary across learning providers. For courses where there is a mandatory requirement for a specific subject, learning providers should consider ways they can provide support to individuals who don't hold a traditional qualification but have nevertheless shown aptitude and competence at the necessary level.

4.2 Recognition of prior learning

Candidates will undergo a selection process for a Graduate Apprenticeship, based on employer HR processes. The admissions departments need to take account of this and liaise with employers to provide advice and guidance on the prior learning and experience that will be accepted for entry onto the course.

A more flexible approach to entry requirements should be adopted by learning providers, and be done in consultation with employers. This should involve consideration of candidates on a case by case basis, who have completed relevant Foundation, Modern or Technical Apprenticeships as well as industry / vendor certifications.

Universities and other providers are asked to consider ways they can optimise the apprentice's prior learning within the programme to ensure there is no unnecessary repetition of learning.

5. Demand

The Digital and ICT sector covers both the manufacture of hardware including computers, consumer electronics and telecommunication equipment and the development and publishing of software, web sites and data management activities. This is a fast-paced sector where new job roles and competencies evolve quickly. The Data Science GA is not confined to the Digital and ICT sector and demand could be greater than the sectoral forecast suggests, some additional analysis has been included to show this.

Employment

In 2019, employment in the sector was 70,900 accounting for three per cent of all employment in Scotland. This made it one of Scotland's smaller key sectors measured by workforce size.

Since 2009, employment in the sector has grown by 12 per cent, compared to a three per cent increase for all industries. More recently (since 2017) employment in the sector increased by one per cent, compared to a decline of one per cent across all industries. This suggests that despite being a relatively small key sector in terms of employment, it has been an important source of jobs growth.

The highest levels of employment were in Edinburgh, East and Midlothian (19,900) and Glasgow (15,800). There was a high concentration in West Lothian where employment in the sector was more than three times the national average. Additionally, employment in the sector was also above average in Edinburgh, East and Midlothian, Fife, and the West Region. This suggests that although nationally the sector is small, there are several regions, mostly in the central belt where the sector is an important source of jobs. Typically, rural factors and logistics have been barriers in the sector; however, technological developments are reducing the limitations of location and geography. Continued improvements in broadband and connectivity infrastructure will help to increase opportunities across Scotland.

The recent growth in employment in the sector is forecast to continue. By 2022, employment in the sector will have increased by 2,600, an increase of four per cent. The growth is expected to continue over the longer term but with a contraction between 2022 and 2029, with growth of three per cent (2,000 people) from 2019 to 2029 forecast. This is the same as the forecast three per cent national growth rate. Growth will create jobs in the sector and the need to replace workers will also generate demand. Based on the number of jobs in sector in 2019, the forecast suggests that three per cent of current positions will experience staff turnover by 2029. The sector's net requirement for workers up to 2029 is expected to be 4,100. However, this is just demand for roles in the Digital and ICT sector and occupational analysis by SDS suggests that demand could much greater – with approximately 12,800 technology job opportunities across all sectors every year in Scotland .

In line with current employment, the greatest percentage of the total net requirement for workers in the Digital and ICT sector will be in Edinburgh, East and Midlothian (40 per cent) and Glasgow (27 per cent). The Edinburgh and South East City Deal will drive some of the demand for people with technology skills as an aim of the deal is to make Edinburgh and South East Scotland the data capital of Europe . This aim is supported by a number of projects including the Data Driven Innovation Skills Gateway.

Occupations

In 2019, the majority (67 per cent) of the ICT/Digital workforce were in higher level occupations. The proportion of the workforce in mid and lower level occupations was lower, 16 per cent each. By 2029, there will be a small change in the occupational structure of the workforce with two percentage points more of the workforce being in higher level occupations, and one per cent fewer in lower level occupations.

ICT and Digital Technologies Sector Skills Investment Plan

The Digital and ICT sector's Skills Investment Plan (SIP) has a number of actions to support the growth ambitions of the sector. GAs could support several actions in the SIP including broadening the future talent pipeline for ICT and digital technology skills. The Scottish Government has also awarded SDS additional funding for cyber security careers events focusing on Work Based Learning (WBL) opportunities – as part of this, SDS has also committed to running industry events to raise awareness of GAs among employers (as well as MAs and FAs).

6. The framework

6.1 Overview

The Data Science (DS) Graduate Apprenticeship is based on industry-defined needs and has been developed in collaboration with employers and the education sector to allow knowledge, understanding, skills and competence to be developed with the necessary attributes industry expects from graduates.

Within the Data Science (DS) Graduate Apprenticeship, the degree content must be delivered per the principles and outcomes detailed in this framework.

The specific Graduate Apprenticeship included in this framework is:

- Data Science (DS)

The output of this Graduate Apprenticeship will be an honours degree at SCQF level 10: Graduate Apprenticeship in BSc (Hons) Data Science.

6.2 Purpose

The purpose of this programme is to produce graduates with the skills, knowledge and behaviours to make a valuable contribution in the field of data science. Graduates will have developed abilities across the core and emerging elements of data science including: statistical techniques, data analytics, data science engineering as well as machine learning and artificial intelligence. They will have the requisite underpinning technical knowledge combined with key capabilities in data governance and the application of ethics, and well-rounded professional skills and behaviours.

The Data Science Graduate Apprenticeship is designed to produce graduates with the following high-level skills and knowledge attributes:

A key part of the Data Science GA is that each of the eight key content areas is combined to deliver a holistic learning experience. These are:

- Data Management
- Data Analytics
- Statistical Techniques
- Machine Learning and Artificial Intelligence
- Data Science Engineering
- Business Insights Through Data Science
- Data Governance and Ethics

Details of the high-level learning and skills outcomes for these content areas are provided in Appendix A along with some examples of low level learning outcomes in Appendix B.

6.3 Occupational outcomes

The Data Science GA is aimed at employment in many different sectors, such as finance, health, retail, and in public sector roles in local and central government. Specific roles will depend on the nature of the organisation, including, but not limited to:

- Data Scientist
- Data Engineer
- Data Analyst
- Data Architect
- Machine Learning Engineer
- Data Insight Analyst

6.4 Learning outcomes

Please refer to Appendix A for a full list of learning outcomes for the Data Science GA.

6.5 Professional recognition

Currently, there is no relevant specific body providing professional recognition for Data Scientists in Scotland. However, there are a range of organisations which provide professional accreditation for IT professionals. Examples of these include:

- Analytical Professionals in Healthcare Association (APHA)
- British Computer Society (BCS)
- Chartered Institute of Librarianship and Information Professionals (CILIP)
- Data Science Council of America (DASCA)
- Digital Analytics Association
- Institute of Engineering Technology (IET)
- The Royal Statistical Society (RSS)

6.6 Related Scottish apprenticeship frameworks

The following Scottish Apprenticeship frameworks and qualifications are relevant pathways that may contribute toward progression into the **Data Science** GA. The apprenticeships are eligible for funding contributions from Skills Development Scotland, and provide employers with a range of alternative pathways at different levels of entry:

Post-school:

- IT and Telecommunications (SCQF level 6)

IT and Communications - SCQF Level 6

- Digital Applications Specialist (SCQF Level 6)

Digital Applications - SCQF Level 6

- IT and Telecommunications Technical Apprenticeship (SCQF Level 8)

IT and Telecommunications - SCQF Level 8

- Information Security Technical Apprenticeship (SCQF Level 8)

Information Security - SCQF Level 8

- Technical Apprenticeship in Data Analytics (SCQF Level 8)

Data Analytics - SCQF Level 8

Appendix A. Learning and skills outcomes

FRAMEWORK: Data Science (SCQF level 10)

This section details the high-level learning and skills outcomes for the GA in **Data Science** that must be covered within the degree. **Appendix B** provides suggested low-level outcomes that may be covered within each section.

This presents a broad set of employer defined outcomes against which universities can position their intended provision to meet the high-level learning outcomes and flavour the programme for their intended employer audience.

Topics and high-level learning and skills outcomes:

Learning and skills outcomes for Data Science	
1.	**Data management**
1.1.	Data strategy
1.2.	Data models
1.3.	Source, collect and integrate data
1.4.	Data federation
1.5.	Data quality
1.6.	Data technologies
1.7.	Data curation, lineage and provenance
1.8.	Awareness of data architecture
2.	**Data analytics**
2.1.	Predictive analytics
2.2.	Analysis of complex data sets and at scale
2.3.	Data analytics platforms
2.4.	Visualise complex, large-scale and variable data
3.	**Statistical techniques**
3.1.	Statistical techniques for data analysis
4.	**Machine learning and Artificial Intelligence**
4.1.	Machine learning approaches

4.2.	Awareness of artificial intelligence systems
5.	**Data science engineering**
5.1.	Data science engineering
5.2.	Data science software applications and programming
5.3.	Data science programmes, tools and techniques
6.	**Business insights through data science**
6.1.	Understanding of the organisation's business strategy
6.2.	Optimise business services through data
6.3.	Support the organisation and the community through data
6.4.	Story-telling through data science
7.	**Data protection and ethics**
7.1.	Data legislation
7.2.	Intellectual Property Rights
7.3.	Data security
7.4.	Ethics in data science
8.	**Data science professional skills and behaviours**
8.1.	Project planning and delivery
8.2.	Communicate effectively
8.3.	Professional practice
8.4.	Commitment to personal development in data science
8.5.	Business organisation

Appendix B. Low-level outcomes examples

The next section provides examples of low level learning and skills outcomes which employers may expect individuals to cover in a Graduate Apprenticeship Data Science degree at SCQF level 10.

The low-level learning and skills outcomes are not intended to be used as a pro-forma curriculum.

Each learning provider will have its own approach to delivering the degree and progression between stages. The low-level skills and derived learning outcomes that are detailed in the following sections will provide guidance to ensure that each degree covers the desired learning outcomes appropriately.

Table 1 Skills and knowledge coverage in data management

1. Data management
1.1. Data strategy
1.2. Data models
1.3. Source, collect and integrate data
1.4. Data federation
1.5. Data quality
1.6. Data technologies
1.7. Data curation, lineage and provenance
1.8. Awareness of data architecture

1.1. Data strategy

DS1.1a Understand the organisation's enterprise data strategy and why it is important.

DS1.1b Apply the organisation's enterprise data strategy.

1.2. Data models

DS1.2a Develop and mature data models.

DS1.2b Implement existing data models, including metadata.

DS1.2c Understand, develop and apply standard data definitions.

1.3. Source, collect and integrate data

DS1.3a Source data through exploration.

DS1.3b Implement additional data collection.

DS1.3c Collect data from multiple different external sources and provide them for analysis.

DS1.3d Integrate data from multiple different internal sources and provide them for analysis/creating data collections.

1.4. Data federation

DS1.4a Understand the range of external data sources.

DS1.4b Modulate and parse diverse external data sources into internal data sets.

1.5. Data quality

DS1.5a Understand the range of common data quality issues that can arise (e.g. miss-classification, spelling errors, duplicate entries, obsolete data, compliance issues, interpretation/translation of meaning).

DS1.5b Understand the importance of robust auditing and categorising of data, and reasons for improving data quality

DS1.5c Audit and categorise data.

DS1.5d Improve data quality, including managing incomplete data (missing data or values).

DS1.5e Identify outliers, anomalies and patterns in data using appropriate techniques.

DS1.5f Apply techniques for substitution/insertion of suitable defaults to determine derived values and produce new composed records.

1.6. Data technologies

DS1.6a Understand different approaches of data systems including relational, data warehousing and online analytical processing, SQL and real-time approaches.

DS1.6b Design, build and operate contemporary, industry standard data systems.

DS1.6c Have an awareness of data processing and storage, including on-premises and cloud technologies.

DS1.6d Understand and apply enterprise-grade data gathering techniques (e.g. scripting).

1.7. Data curation, lineage and provenance

DS1.7a Develop and maintain a historical data repository of analysis results.

DS1.7b Understand common ways to curate data and how to apply them.

DS1.7c Ensure data quality, cleanliness, accessibility, and compliance with standards.

DS1.7d Understand how to create the system processing order of the unit/data flow.

DS1.7e Create the data provenance for auditing and intelligence.

1.8. Awareness of data architecture

DS1.8a Have an understanding of different approaches to data architecture.

DS1.8b Have a high-level understand of how different approaches to data architecture apply to your organisation.

DS1.8c Understand how business requirements drive the creation of data architecture.

DS1.8d Have an understanding of data formats, structures and data delivery methods including “unstructured” data.

Table 2 Skills and knowledge coverage in data analytics

2. Data analytics
2.1. Predictive analytics
2.2. Analysis of complex data sets and at scale
2.3. Data analytics platforms
2.4. Visualise complex, large-scale and variable data

2.1. Predictive analytics

DS2.1a Have an awareness of techniques such as machine learning, data mining, prescriptive and predictive analytics (trends and patterns) and forecasting.

DS2.1b Apply a range of techniques to analyse data to discover new relationships throughout the data lifecycle.

DS2.1c Develop specialised analytics to enable agile decision-making.

2.2. Analyse complex data sets and at scale

DS2.2a Understand what is meant by ‘complex data’.

DS2.2b Understand the impact of at-scale data analytics.

DS2.2c Apply appropriate techniques to analyse complex and at-scale data sets.

DS2.2d Research and analyse complex data sets.

2.3. Data analytics platforms

DS2.3a Have an awareness of the range of enterprise-grade data analytics platforms.

DS2.3b Use contemporary data analytics platforms to process data to produce desired business outcomes.

2.4. Visualise complex, large-scale and variable data

DS2.4a Understand the uses of data visualisation (e.g. data exploration; identifying issues/problems, relationships and patterns; identifying key messages; clarification etc.).

DS2.4b Have an awareness of the tools and techniques for data visualisation.

DS2.4c Apply data visualisation appropriate to the intended audience.

DS2.4d Visualise complex and variable data and the results of data analysis both to internal teams and external stakeholders.

Table 3 Skills and knowledge coverage in statistical techniques

3. Statistical techniques
3.1. Statistical techniques for data analysis

3.1. Statistical techniques for data analysis

DS3.1a	Understand the different types of quantitative research methods and statistical techniques for analysing data (hypothesis testing; standard deviation; regression; correlation; sample size determination; experimental design).
DS3.1b	Understand the role of statistical testing and how to apply different statistical tests.
DS3.1c	Apply quantitative techniques on available data for analysis (including ad hoc and routine) and prediction to deliver insights, including consideration of experimental design and measurement.
DS3.1d	Test the validity and robustness of data, using appropriate statistical techniques, such as significant testing, A/B test etc.
DS3.1e	Implement improved statistical techniques within domain context.
DS3.1f	Understand how data bias is created and ways of avoiding bias.
DS3.1g	Identify and address data bias using appropriate techniques.

Table 4 Skills and knowledge coverage in machine learning and artificial intelligence

4. Machine learning and artificial intelligence
4.1. Machine learning approaches
4.2. Awareness of artificial intelligence systems

4.1. Machine learning approaches

DS4.1a Understand the principles, advantages, limitations and possible applications of machine learning and how to apply a variety of learning algorithms to data.

DS4.1b Understand the strengths and weaknesses of common machine learning approaches.

DS4.1c Understand the underlying mathematical relationships within and across machine learning algorithms.

DS4.1d Design and implement machine learning algorithms for a range of real-world applications.

DS4.1e Optimise and improve analytical algorithms.

DS4.1f Understand how to apply algorithms in a commercial environment.

4.2. Awareness of artificial intelligence systems

DS4.2a Understand and define what constitutes "Artificial" Intelligence compared with human intelligence and traditional information processing, and how to identify systems with Artificial Intelligence.

DS4.2b Understand how Artificial Intelligence enables capabilities.

DS4.2c Understand the limitations of current Artificial Intelligence techniques.

Table 5 Skills and knowledge coverage in data science engineering

5. Data science engineering
5.1. Data science engineering
5.2. Data science software applications and programming
5.3. Data science programmes, tools and techniques

5.1. Data science engineering

DS5.1a Understand the different specialist data analytical tools and how they can be used to support decision-making.

DS5.1b Understand the engineering principles involved in data science engineering.

5.2. Data science software applications and programming

DS5.2a Prototype and test data analytics applications and develop a range of structures, tools, processes and systems for novel applications using data science programming languages.

DS5.2b Use engineering principles to research, design and prototype data analytics software applications.

5.3. Data science programmes, tools and techniques

DS5.3a. Develop specialised data analysis tools to support story-telling, decision science and productisation.

Table 6 Skills and knowledge coverage in business insights through data science

6. Business insights through data science
6.1. Understand the organisation's business strategy
6.2. Optimise business services through data
6.3. Support the organisation and the community through data
6.4. Story-telling through data science

6.1. Understand the organisation's business strategy

DS6.1a Demonstrate an awareness of the organisation's business goals and strategy.

DS6.1b Keep up to date with the industry's changing information needs for implementing the strategy.

6.2. Optimise business services through data

DS6.2a Demonstrate how data science can be applied to improve an organisation's processes, operations and outputs.

DS6.2b Have an awareness of data-driven decision-making and good practice in the use of evidence and analytics in making choices and decisions.

DS6.2c Translate the business'/customer requirements and provide actionable insights to meet these needs.

DS6.2d Use intelligence to inform improvements to existing business services, or for developing new services.

6.3. Support the organisation and the community through data

DS6.3a Demonstrate an awareness of the impact of decision science on data science.

DS6.3b Provide data science support services to other roles and functions within, or outside, the organisation.

DS6.3c Provide professional data/statistical advice (including governance advice) to colleagues/customers.

DS6.3d Demonstrate the application of governance in data science.

6.4. Story-telling through data science

DS6.4a Demonstrate the different ways of communicating meaning from data.

DS6.4b Select and utilise the most appropriate medium for each audience, to visualise and present information (such as visualisation, technical writing, reporting and dashboards).

DS6.4c Find, present, communicate and disseminate outputs effectively and with high impact through creative storytelling, tailoring the message for the audience.

DS6.4d Make compelling recommendations to decision makers to contribute towards the achievement of organisation goals.

Table 7 Skills and knowledge coverage in data governance and ethics

7. Data protection and ethics
7.1. Data standards and legislation
7.2. Intellectual property rights
7.3. Data security
7.4. Ethics in data science

7.1. Data standards and legislation

DS7.1a Understand the impact of national and international regulations (including the General Data Protection Regulation) on data science.

DS7.1b Work in compliance with national and international regulations and sector-specific standards on the use of data.

7.2. Intellectual Property Rights

DS7.2a. Understand and apply the different rules and protocols that apply to internal and external uses of data, including what can and can't be shared.

DS7.2b. Demonstrate an understanding of IPR and how it applies to the organisation.

7.3. Data security

DS7.3a Understand how data science operates within the context of data governance and data security.

DS7.3b Understand how to classify data.

DS7.3c Distribute information in compliance with data security standards (including organisational standards) and legislation.

DS7.3d Consistently apply data security mechanisms and controls (e.g. encryption, pass-wording) at each stage of the data lifecycle.

7.4. Ethics in data science

DS7.4a Understand how data and analysis may exhibit biases and prejudice.

DS7.4b Understand how ethics and compliance affect data science work.

Table 8 Skills and knowledge coverage in data science professional behaviours

8. Data science professional skills and behaviours
8.1. Project planning and delivery
8.2. Communicate effectively
8.3. Professional practice
8.4. Commitment to personal development in data science
8.5. Business organisation

8.1. Project planning and delivery

DS8.1a Understand a range of contemporary project management methods and their differences.

DS8.1b Understand the different phases of a project including; initiation, progress gathering and reporting by exception, project deviation and recovery, capturing and managing actions and the final handover of specified deliverables.

DS8.1c Plan a data project against customer requirements for a data study.

DS8.1d Identify factors such as risks and assumptions that may affect project implementation and delivery.

DS8.1e Understand roles and responsibilities in a project team and how they interact.

DS8.1f Work with internal and external stakeholders in project delivery.

8.2. Communicate effectively

DS8.2a Make concise, engaging and well-structured verbal presentations, arguments and explanations of varying lengths, with and without the use of media.

DS8.2b Demonstrate an ability to actively listen to others, appreciating their point of view.

DS8.2c Be fluent in written communications with the ability to articulate complex issues, selecting an appropriate structure and with appropriate tone, style and language.

DS8.2d Prepare for and lead effective meetings with clear agendas and defined outcomes, keeping to time and preparing clear outcomes or ‘meeting minutes’ in a timely manner.

DS8.2e Communicate complex information to different audiences in an understandable way.

DS8.2f Produce clear and consistent technical documentation using standard templates.

8.3. Professional practice

DS8.3a Demonstrate effective work habits, including time management and prioritisation.

DS8.3b Demonstrate well-developed problem-solving abilities.

DS8.3c Demonstrate accuracy and attention to detail.

DS8.3d Know and manage own emotions, strengths and weaknesses.

DS8.3e Be aware of and take account of the needs and concerns of others, especially where related to diversity and equality.

DS8.3f Be confident and flexible in dealing with new and changing interpersonal situations.

DS8.3g Demonstrate a high level of professional and ethical conduct.

DS8.3h Engage and interact with professional networks and other disciplines.

DS8.3i Keep accurate and auditable records of decisions made and actions taken in response.

DS8.3j Demonstrate awareness of efficient use of resources (including financial resources)

8.4. Commitment to personal development in data science

DS8.4a Critically review own development needs and maintain an understanding of the limits of personal knowledge and skills.

DS8.4b Plan how to meet personal and organisational objectives

DS8.4c Keep up to date with developments in data science (e.g. new techniques, methodologies, platforms, software etc.).

DS8.4d Understand the evolution of data science as a discipline.

8.5. Business organisation

DS8.5a Understand the context of data science and the data science community in relation to your business or organisation.

DS8.5b Understand roles and responsibilities for data science in the organisation.

Appendix C. Framework development summary

A GA framework sets out the required knowledge, skills and learning outcomes identified through employer and key partner consultation to support the delivery of a Graduate Apprenticeship programme. This is achieved through employer and key partner input to Technical Expert Groups (TEGs).

TEGs are short life working groups designed to act as an advisory group on behalf of the sector and contributes to the development and course design of a GA. TEGs are integral to the process of developing GAs that provide quality, consistency and relevance to industry.

Each TEG is made up of employers, professional or industry bodies, learning providers, and subject/technical experts from the related industry.

The following organisations were consulted in the development of this framework:

Data Science (SCQF level 10)

Employers	Learning providers	Qualification and industry bodies
Aberdeen Standard Investments	Data Lab	
BBC	University of Edinburgh	
CGI	University of St Andrews	
Lloyds Banking Group	University of Strathclyde	
Microsoft		
NHS		
PWC		
Sopra Steria		
JP Morgan		

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Skills Development Scotland

This framework is also available on the Skills Development Scotland corporate website:
www.skillsdevelopmentscotland.co.uk