

AI and the Digital Ecosystem

BCS Foundation Award



September 2020 v1.0

This professional certification is not regulated by the following United Kingdom Regulators – Ofqual, Qualification in Wales CCEA or SQA.

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Document Change History

Any changes made to the syllabus shall be clearly documented with a change history log. This shall include the latest version number, date of the amendment and changes made. The purpose is to identify quickly what changes have been made.

Version Number	Changes Made
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V1.0	Document Creation
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Introduction

A digital ecosystem is fundamental to the operations of any modern business, and with the addition of AI it has the capability to enable an organisation to better service its customers and manage its data.

This award introduces the key concepts associated with AI and explores its relationship with the systems and processes that make up the digital ecosystem. It will consider how AI can empower organisation to utilise Big Data through the use of Business Analysis and Machine Learning, and encourages candidates to consider a future vision of the world that is powered by AI.

Qualification Suitability and Overview

There are no specific entry requirements for this award. However, some professional experience in an IT environment may be advantageous.

The BCS Foundation Award in AI and the Digital Ecosystem has been designed for individuals interested in exploring the power of AI and how it can drive and support Digital Transformation when made part of an organisation's digital eco system.

This award has been created alongside a selection of other awards available from BCS which offer candidates a clear pathway of progression into other disciplines of IT. This makes it ideally suited for those looking for a change in career, an upskilling workforce, and sustainable employers.

This award represents 5 credits that can count towards the credits required for a BCS Foundation Certificate or Diploma in a relevant discipline.

Candidates can study for this award by attending a training course provided by a BCS accredited Training Provider or through self study.

Total Qualification Time	Guided Learning Hours	Independent Learning	Assessment Qualification Time	Credits
50 hours	16 hours	33.5 hours	0.5 hours	5

*Examples of Independent Learning include reading of articles or books, watching videos, attendance of other types of training or work shadowing.

Trainer Criteria

It is recommended that to effectively deliver this award, trainers should possess:

- BCS Foundation Certificate in Artificial Intelligence or a similar qualification
- A minimum of 2 years' training experience or a recognised training qualification.

SFIA Levels

This award provides candidates with the level of knowledge highlighted within the table, enabling candidates to develop the skills to operate successfully at the levels of responsibility indicated.

Level	Levels of Knowledge	Levels of Skill and Responsibility (SFIA)
K7		Set strategy, inspire and mobilise
K6	Evaluate	Initiate and influence
K5	Synthesise	Ensure and advise
K4	Analyse	Enable
K3	Apply	Apply
K2	Understand	Assist
K1	Remember	Follow

SFIA Plus

This syllabus has been linked to the SFIA knowledge skills and behaviours required at level 3 for an individual working in an analytical role.

KSB01

Acquiring a proper understanding of a problem or situation by breaking it down systematically into its component parts and identifying the relationships between these parts. Selecting the appropriate method/tool to resolve the problem and reflecting critically on the result, so that what is learnt is identified and assimilated.

Further detail around the SFIA Levels can be found at www.bcs.org/levels.

Learning Outcomes

Upon completion of the award, candidates will be able to demonstrate:

- 1. An understanding of the key components of AI
- 2. An understanding of the relationship between AI and The Digital Ecosystem
- 3. An understanding of the relationship between AI and Data
- 4. An understanding of the role the IT professional plays in supporting AI for the future

Syllabus

1. Key components of AI (20%) (K1)

Candidates will be able to:

- 1.1 Recall the general definition of human intelligence. (see Encyclopaedia Britannica)
- 1.2 State a general definition of artificial intelligence and how it relates to human intelligence.
- 1.3 Describe how the following are used within an application of Artificial intelligence; Machine Learning, Deep Learning, Data Science, Knowledge-Based systems , Robotics and Automation.

Indicative content

- a. Machine Learning
- b. Deep Learning
- c. Data Science
- d. Knowledge-Based Systems
- e. Robotics and Automation

Guidance

Learners should have a basic understanding of each of these applications and how they contribute to an application of Artificial Intelligence. It is important to understand the relationship between humans and AI. Learners should understand the difference and similarities between human and artificial intelligence.



Syllabus

2. AI and the digital ecosystem (20%) (K1/2)

Candidates will be able to:

2.1 Explain what a digital ecosystem is.

Indicative content

- a. The purpose of an ecosystem
- b. Components of a digital ecosystem
- c. Digital Transformation
- d. Digitisation – e.g. paperless office, credit cards, e-commerce, online banking, apple/google pay, personal assistants
- e. Fundamental enabler (human plus machine systems)
- f. The Internet of Things, big data, smartphones/smart offices, working from home

Guidance

How are digital technologies and AI transforming organisations? What are the components of a digital ecosystem? Learners should be encouraged to think about the components of the digital ecosystems in which they live and work.

Learners should also consider the Internet of Things as a digital ecosystem and its potential to evolve and to create value. The value of a digital ecosystem is to be explained as well as the challenges that may be encountered.

Candidates will be able to:

2.2 Describe an ecosystem mindset.

Indicative content

- a. Collaboration
- b. Mastery
- c. Recognising your company strengths
- d. Trust
- e. Openness
- f. Integrity

Guidance

An ecosystem is based on the concept of systems, people and processes working together (collaboration) to deliver better results and service, and the willingness towards continual improvement. If one part of the ecosystem is not working, then the whole system will not work. Think about the need to accept and recognise strengths and weaknesses to ensure collaboration. Consider the values people need to demonstrate to work collaboratively.

Candidates will be able to:

2.3 Identify how AI can facilitate a digital ecosystem that works intuitively.

Indicative content

- a. Integrated systems
- b. Customer experience
- c. Efficient processes
- d. Data architecture – one true source of data
- e. Automation
- f. Learning from experience
- g. User stories

Guidance

This aims to consider the benefits of an effective digital ecosystem and how AI can support it to deliver an improved experience, personalisation, and efficiency. It considers the need to understand the way AI interacts with other systems.

Syllabus

2. AI and the digital ecosystem (20%) (K1/2)

Candidates will be able to:

2.4 Discuss why you might make use of AI to create a digital ecosystem as a driver or enabler.

Indicative content

- a. Personal assistants e.g. Siri, Alexa
- b. Autonomous vehicles (5 levels of autonomy)
- c. Creating media e.g. movies, music
- d. Smart energy e.g. smart meters
- e. Smart infrastructure e.g. homes, offices, roads
- f. Healthcare e.g. monitoring machines, smart wearable technology
- g. Social care e.g. care assistants, keeping the customer independent
- h. Education e.g. learning assistant
- i. Engineering e.g. digital twin concept

Guidance

Learners should be encouraged to consider different uses of AI, innovation, and to understand how embedded AI has become within human society. Think about the value an ecosystem can have for an organisation and its stakeholders.

3. The relationship between AI and Data (30%) (K1/2/3)

Candidates will be able to:

3.1 Explain data infrastructure with specific relevance to Big Data.

Indicative content

- a. What is Big Data?
- b. Why is Big Data difficult to work with?
- c. Challenges and risks surrounding Big Data
- d. Benefits and uses - how can we take advantage of Big Data?

Guidance

Understanding the value of Big Data to an organisation is useful when considering how AI (such as Machine Learning) can make better use of data and provide greater insight, to enable more informed decisions to be made. Think about the idea of a human working with the volume of data that is now available. Consider the idea of using the Big Data in real time to make real decisions.

Candidates will be able to:

3.2 Describe the following concepts within data architecture.

Indicative content

- a. Labelled or unlabelled data
- b. Missing data
- c. Encoding data
- d. Cleaning data
- e. Structured or unstructured data

Guidance

Machine Learning and Neural Networks are dependent on data. It is therefore useful to understand these concepts and the relationship between data and AI. This also involves understanding how AI can support an organisation's data architecture. Consider open source platforms used to manage data.

Syllabus

3. The relationship between AI and Data (30%) (K1/2/3)

Candidates will be able to:

3.3 Suggest ways in which AI can support in the utilisation of Big Data.

Indicative content

- a. Machine Learning
- b. Deep Learning
- c. Business Analytics

Guidance

Discuss how AI is enabling organisations to better understand their business, their customers and their market through the collection and analysis of Big Data. The more data provided the better AI can become; however it is important to understand the need for good data architecture, management and quality of data.

Candidates will be able to:

3.4 Recognise different approaches used within the testing of AI systems.

Indicative content

- a. Regulations and standards
- b. Stakeholder buy-in and ownership
- c. User acceptance criteria
- d. Use of AI in testing automation – AI led quality assurance
- e. Ongoing feedback through continuous testing and deployment (agile approach) i.e. 'learning from experience'.

Guidance

An organisation may utilise a combination of different methods of testing depending on those most appropriate. Candidates should consider the need for quality assurance and the problems that can occur if quality assurance is not part of the design and build process. Consider what testing may be required in the production of machine learning - how is this similar or different to testing other product? Think about testing throughout the cycle, for example, testing the data, testing the algorithm. Consider the different levels of testing and the different outputs. For example, the responsiveness of a driverless car or the accuracy of an application used diagnosis of medical conditions.

4. The potential future of AI (30%) (K1/2)

Candidates will be able to:

4.1 Identify industries that can invest in AI.

Indicative content

- a. Local transmission/ interaction (5G)
- b. Health
- c. Financial
- d. Engineering
- e. Retail
- f. Education

Guidance

How has AI already transformed certain industries? What potential does it have for further digital transformation? Learners should explore the use of AI in different industries to consider its multiple purposes and where it has created efficiencies/enabled human beings to do more.

Candidates will be able to:

4.2 Recognise the role of AI in raising human intelligence.

Indicative content

- a. Intelligence Augmentation

Guidance

AI as a means to enhance human intelligence, not to replace it (complimentary). Explore how AI can assist human beings and improve human decision making. It is useful to consider how AI provides humans with greater access to information, empowering them to learn.

Syllabus

4. The potential future of AI (30%) (K1/2)

Candidates will be able to:

4.3 Explain the concept of digital singularity.

Indicative content

- a. Machine Intelligence equal to Human intelligence
- b. How close are we to singularity?

Guidance

Singularity Theory: The prediction that machine intelligence will eventually reach the same level as human intelligence, at which point they merge, after which machine intelligence will become more powerful. Learners should consider the rate at which AI has evolved. How close are we to singularity? What are the risks and benefits?

Candidates will be able to:

4.4 Explain the need for individuals and organisations to maintain and update their skills and knowledge in relation to current and emerging technologies.

Indicative content

- a. Up and coming computing technologies
- b. Quantum computing and mechanics
- c. Advancements in coding
- d. Changes in technology
- e. Risk of being left behind
- f. Competitive edge
- g. Cloud computing

Guidance

It is important to understand the need for Continued Professional Development to ensure organisations are equipped with the right people and the right skills for the future. As technology is constantly evolving and advancing, the need to stay current in terms of skills and competencies is essential in order for organisations to better utilise technology.

Candidates will be able to:

4.5 Identify the role the IT professional plays in supporting a utopian future with AI.

Indicative content

- a. What is a utopia?
- b. Importance of an ethics first approach
- c. Understanding the power IT professionals have
- d. Awareness of risks associated with AI
- e. Human compatible AI

Guidance

Learners should consider the need for trustworthy and robust AI, through a human centric ethical purpose. What does a utopian future with AI look like? Equally what does a dystopian future look like? What responsibility do we as IT professionals have for ensuring a utopian future? It is useful to link back to the ethical principles that govern IT professionals.

Examination Format

This award is assessed through completion of an invigilated online exam which candidates will only be able to access at the date and time they are registered to attend.

Type	16 Multiple Choice questions, 2 Scenario Based Question
Duration	30 minutes
Supervised	Yes
Open Book	No (no materials can be taken into the examination room)
Passmark	13/20 (65%)
Delivery	Digital format only.

Adjustments and/or additional time can be requested in line with the BCS reasonable adjustments policy for candidates with a disability, or other special considerations including English as a second language.

Question Weighting

Each major subject heading in this syllabus is assigned a percentage weighting. The purpose of this is:

- 1. Guidance on the proportion of content allocated to each topic area of an accredited course.
- 2. Guidance on the proportion of questions in the exam.

Syllabus Area

1. Key components of AI

2. AI and the digital ecosystem

3. The relationship between AI and Data

4. The potential future of AI

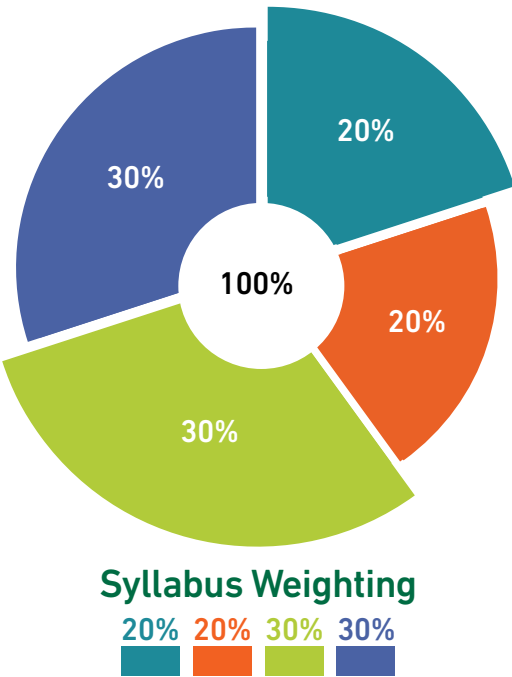
Question type

Multiple Choice 20%

Multiple Choice 20%

Scenario Based Multiple Choice 30%

Scenario Based Multiple Choice 30%



Recommended Reading

The following titles are suggested reading for anyone undertaking this award. Candidates should be encouraged to explore other available sources.

Title:	The Singularity is Near
Author:	Raymond Kurzweil
Publisher:	Duckworth
Publication Date:	March 2006
ISBN:	0715635611

Title:	Human Compatible: AI and the problem of control
Author:	Stuart Russell
Publisher:	Allen Lane
Publication Date:	October 2019
ISBN:	0241335205

Title:	Life 3.0: Being Human in the Age of Artificial Intelligence
Author:	Max Tegmark
Publisher:	Penguin
Publication Date:	July 2018
ISBN:	ISBN: 9780141981802

Title:	Human + Machine: Reimagining Work in the Age of AI
Author:	Paul R. Daugherty and H. James Wilson
Publisher:	Harvard Business Review Press
Publication Date:	March 2018
ISBN:	1633693864

Title:	The Forth Industrial Revolution
Author:	Klaus Schwab
Publisher:	Currency
Publication Date:	January 2017
ISBN:	9781524758868

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