Higher National Unit specification

General information

Unit title: Emerging Technologies and Experiences (SCQF level 7)

Unit code: HF85 34

Superclass:	CB
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Version:	01

Unit purpose

The purpose of this Unit is to introduce learners to digital technologies that have recently emerged, or are about to emerge, into the public domain. It will also cover the associated experiences made possible by these technologies.

It is suitable for a wide range of learners who wish to gain an appreciation of recently developed digital technologies, such as big data and virtual reality, and the types of digital technology that is about to emerge in the near future, such as machine learning.

The Unit explores long-term technological trends, the reasons for them, how these trends are manifesting themselves in current and future technologies, and how these technologies may be used vocationally, educationally and socially. The personal, societal and business applications and implications of these technologies are also considered.

This **non-specialist Unit** is suitable for all learners who are undertaking programmes of study at this level. It is appropriate for inclusion in a wide range of learning programmes and may be customised to match learners' personal and vocational interests.

On completion of this Unit, learners will understand technological trends, current and near-future technologies, how these technologies may be used, and their personal, economic and societal implications.

Outcomes

On successful completion of the Unit the learner will be able to:

1   Explain trends in digital technologies.
2   Describe the potential uses of emerging digital technologies.
3   Evaluate an emerging digital technology for vocational or educational use.

Higher National Unit specification: General information (cont)

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Credit points and level

1 Higher National Unit credit at SCQF level 7: (8 SCQF credit points at SCQF level 7)

Recommended entry to the Unit

Access to this Unit is at the discretion of the centre. However, it is recommended that learners should have a reasonable level of knowledge of computing terminology and computing technology. This could be evidenced by possession of *the Information and Communication Technology (ICT)* Core Skill at SCQF level 5 or 6.

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Equality and inclusion

This Unit Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

Higher National Unit specification: Statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain trends in digital technologies.

Knowledge and/or Skills

♦ Characteristics of digital technologies
♦ Milestones in the development of digital technologies
♦ Changes in capacity, speed and computing power over time
♦ Current trends in digital technologies and the reasons for these trends
♦ Potential future developments in digital technologies.
♦ Personal, economic and societal implications of current trends in digital technologies

Outcome 2

Describe the potential uses of emerging digital technologies.

Knowledge and/or Skills

♦ Emerging digital technologies
♦ Potential experiences in education, business and society made possible by emerging digital technologies
♦ Potential benefits of emerging digital technologies
♦ Potential risks of emerging digital technologies
♦ Ethical and legal implications of emerging digital technologies

Outcome 3

Evaluate an emerging digital technology for vocational or educational use.

Knowledge and/or Skills

♦ Uses of an emerging technology in specific vocational and educational fields
♦ Research methods and skills
♦ Evaluation methods
♦ Critical thinking
♦ Computational thinking

Higher National Unit specification: Statement of standards (cont)

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Evidence Requirements for this Unit

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills across all Outcomes.

Evidence is normally required for **all** of the Knowledge and Skills in **every** Outcome. However, sampling may be used in a specific circumstance (see below).

The Evidence Requirements for this Unit will take the form of evidence of **cognitive** competence (only). It may be written or oral or a combination of these. Evidence may be captured, stored and presented in a range of media (including audio and video) and formats (analogue and digital). The amount of evidence should be the **minimum** consistent with the stated Knowledge and Skills.

For Outcome 1, only the **major** milestones need be explained but milestones must include hardware and software developments; at least **two** current trends must be explained; at least **two** potential future developments must be explained. The personal, economic and societal implications must include personal privacy and cyber security; these implications may be related to these trends or described generically.

For Outcome 2, candidates must describe at least **three** potential uses of emerging digital technologies and their associated benefits and risks. At least **one** must relate to education, **one** to business, and **one** to society (and the benefits and risks of each). The evidence for the ethical and legal implications of emerging digital technology may be related to these potential uses or described generically.

The evidence for Outcome 3 must relate to at least **one** vocational **or** educational application of emerging digital technology; this must relate to the candidate's **own** vocational or educational interests. The evidence for research methods and skills, evaluation methods, critical thinking and computational thinking will be **implicit** in the evaluation and need not be evidenced separately. The evaluation must include:

♦   description of the technology (generic description)
♦   how the technology works (generic explanation)
♦   features of the technology (specific to this use)
♦   adoption of the technology (specific to this use)
♦   barriers to adoption (specific to this use)
♦   effectiveness of the technology (specific to this use)
♦   benefits of the technology (generic explanation)
♦   risks of the technology (generic explanation)
♦   likelihood of success for the technology (specific to this use)

The evidence (for all Outcomes) may be wholly or partly produced under controlled conditions. When evidence is produced in uncontrolled or loosely controlled conditions it must be authenticated. The *Guide to Assessment* provides further advice on methods of authentication. Evidence of authentication must be provided when any of the evidence is generated under loosely controlled conditions.

Higher National Unit specification: Statement of standards (cont)

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There are no time limitations on the production of evidence (but see exception below). The evidence may be produced at any time during the life of the Unit. Learners may use reference materials when undertaking assessment (but see exception below).

Sampling is permissible for Outcome 1 and Outcome 2 when the evidence is produced through testing. The test may take any form (including oral) but must be supervised, unseen and timed. The contents of the test must sample broadly and proportionately from the contents of Outcomes 1 and 2 with approximately equal weighting for each Outcome. Access to reference material is not appropriate for this type of assessment.

All evidence must be consistent with the level of this Unit. The following SCQF level Descriptors are particularly relevant to this Unit and may be applied to the evidence when appropriate.

♦ Knowledge is embedded in theories, concepts and principles.
♦ Exercise initiative and independence in carrying out defined activities.
♦ Use a range of numerical and graphical techniques skills in combination.
♦ Present and evaluate arguments, information and ideas that are routine to computing.

The Guidelines on Approaches to Assessment (see the Support Notes section of this specification) provides specific examples of instruments of assessment.

Higher National Unit Support Notes

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Unit Support Notes are offered as guidance and are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

The Unit is intended to provide learners with an insight into digital technologies and experiences that have recently emerged, or are about to emerge, into the public domain.

It is suitable for a wide range of learners, undertaking a wide range of learning programmes.

At the time of writing, emerging technologies include:

♦ mobile technology
♦ cyber security
♦ cloud computing
♦ speech recognition
♦ virtual worlds
♦ robotics
♦ big data
♦ Internet of Things (IOT)
♦ real-time language translation
♦ augmented reality
♦ virtual reality
♦ driverless cars
♦ natural language processing
♦ machine learning
♦ artificial intelligence.

The Unit explores long-term technological trends, the reason for them and how these trends are manifesting themselves in current and future technologies. Part of this will involve looking backwards at key milestones in the development of computing (and other digital technologies). Learners will gain knowledge of how capacity, speed and computing power are measured, and how the power of computing devices has increased over time.

Learners will gain an insight into how new digital technologies may be used vocationally, educationally and socially. The personal, societal, business and socio-economic implications of these developments will also be considered.

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Learners will gain an appreciation of recently developed digital technologies and the types of technologies that are about to emerge. They will also consider how these could be applied in a personal, business and societal context.

The precise content of this Unit will change over time, as technologies emerge and technologies that are currently emerging become the norm.

Guidance on approaches to delivery of this Unit

It is anticipated that a sequential approach to delivery should be taken, where students gain the underpinning knowledge by studying and completing Outcome 1, before moving onto Outcome 2, which will be a mixture of taught knowledge and research, before finally attempting Outcome 3, where it will be down to the learner to research and report their findings.

The actual distribution of time between Outcomes is at the discretion of the centre. However, one possible approach is to distribute the available time as follows:

Outcome 1   15 hours
Outcome 2   15 hours
Outcome 3   10 hours

It is recommended that centres should provide learners with hands-on experience with emerging technologies. For instance, if you are looking at virtual reality, centres could provide learners with opportunities to try out Oculus Rift™ or a cheaper alternative such as Google Cardboard™. Day trips to technology companies and Science Centres, where learners could experiment with the latest digital technology, are also encouraged.

For **Outcome 1** learners should learn about the following topics:

♦ Characteristics of digital technologies:
   — differences between analogue and digital technology.
♦ Milestones in the development of digital technologies (hardware and software):
   — key developments in computing and other digital technologies over the years.
   — evolution of software running on digital devices over the years.
♦ Changes in capacity, speed and computing power over time:
   — methods for measuring capacity, speed and throughput of computers.
   — relationship between true computing power and measurements of speed or frequency of CPUs (Central Processing Units):
   — other factors apart from CPU speed which affect computing power.
   — the increase in capacity, speed and power of computers over the years.
   — Moore's Law and its relevance today.
♦ Current trends in digital technologies (hardware and software):
   — trends in current digital hardware technologies.
   — trends in software in relation to current digital technologies.
   — adoption cycle.

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♦ Reasons for current trends in digital technologies:
— the factors driving the current trends in digital technologies.
♦ Potential future developments in digital technologies:
— near future developments in digital technologies.
— likelihood of the success of these technologies.
♦ Personal, economic and societal implications of current trends in digital technologies:
— personal, economic and societal implications of current trends.
— personal privacy and cyber security in relation to current trends.

In **Outcome 2** learners should learn about a variety of emerging technologies and the potential experiences that will be made possible by them. Learners should study the potential benefits and misuses of these technologies.

In **Outcome 3** learners are required to research, critically analyse and evaluate an emerging digital technology. In preparation for this learners should study basic evaluation and research methods. Instructors should work with learners on their critical analysis and computational thinking skills. It is recommended that, if possible, centres should provide learners with hands on experience with the emerging technology that the learner is evaluating.

Guidance on approaches to assessment of this Unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to candidates.

A traditional approach to assessment would involve a test for Outcomes 1 and 2, and a research activity for Outcome 3.

The test would sample the knowledge and understanding in Outcome 1 and Outcome 2. The test could take one of various forms including a multiple choice test, short answer test or extended response test. If a multiple choice or short answer test is used it would be expected that scenario type questions would be employed. The test would take place under controlled conditions and be time-limited. An appropriate pass mark would be set (which would reflect the type of test used).

The research activity would involve candidates exploring a vocational or educational use of an emerging digital technology. For example, this could involve a Business Education student exploring the commercial uses of big data; or a Care student exploring the rehabilitation uses of virtual reality; or an Automotive Engineering student exploring the uses of driverless cars. The findings could be provided in a written report or, alternatively, a presentation. Whatever approach is taken, the following should be covered:

♦ description of the technology (generic description)
♦ how the technology works (generic explanation)
♦ features of the technology (specific to this use)
♦ adoption of the technology (specific to this use)
♦ barriers to adoption (specific to this use)
♦ effectiveness of the technology (specific to this use)
♦ benefits of the technology (generic explanation)

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♦ risks of the technology (generic explanation)
♦ likelihood of success for the technology (specific to this use)

If the candidate chooses to write a report, it should contain a title page, table of contents, conclusions and a bibliography.

A more contemporary approach to assessment would be to use a web log (blog) to record learning throughout the life of the Unit. If this approach were taken, sampling would not be appropriate. The blog would contain evidence for all Knowledge and Skills statements. The blog would record, on a daily or weekly basis, the learning that has occurred. It would provide evidence for all of the Knowledge and Skills using a variety of media and links to external resources.

There would be no time limitation on the completion of the blog since it would be done on an on-going basis throughout the life of the Unit.

Assessors must assure themselves of the authenticity of the evidence. Authentication may take various forms including, but not limited to, oral questioning and plagiarism checks. Some forms of evidence generation (such as video recordings) have intrinsic authentication and would require no further means of verification.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Opportunities for developing Core and other essential skills

This Unit provides opportunities to develop some of the following Core Skills:

Communication (SCQF level 6)
*Information and Communication Technology (ICT) (*SCQF level 6)
Numeracy (SCQF level 6)
Problem Solving (SCQF level 6)

The Written Communication component of *Communication* could be developed when learners produce their reports/presentations as part of Outcome 3.

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Both components of *ICT* (Accessing Information and Providing/Creating Information) could be developed in all of the Outcomes within this Unit. The first component could be developed in all three Outcomes; the latter component is particularly relevant to Outcome 3.

The Using Graphical Information component within *Numeracy* could be developed when learners are producing their report or presentation as part of Outcome 3.

All three components within *Problem Solving* could be developed as part of Outcome 3. Critical Thinking, Planning and Organising, and Reviewing and Evaluating are important skills for this Outcome.

History of changes to Unit

Version	Description of change	Date

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Business Development and Customer Support team, telephone 0303 333 0330.

General information for learners

Unit title: Emerging Technologies and Experiences (SCQF level 7)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

The purpose of this Unit is to introduce you to digital technologies and experiences that have recently emerged, or are about to emerge, into the public sphere. It will give you an opportunity to learn about, and use, some of the latest digital technology available for personal or business use.

The types of technologies covered include:

♦ mobile technology
♦ cloud computing
♦ big data
♦ Internet of Things (IOT)
♦ speech recognition
♦ augmented reality
♦ virtual reality
♦ cyber security
♦ robotics
♦ driverless cars
♦ language translation
♦ natural language processing
♦ machine learning
♦ artificial intelligence

The Unit explores long-term technological trends, and the reason for them, how these trends are manifesting themselves in current and future technologies, and how these new digital technologies may be used in employment and also for learning. The personal, societal, business and socio-economic applications and implications of these developments will also be considered. These include the implications for your privacy and also the security implications for business.

On the completion of this Unit you will understand long-term technological trends, current and near-future emerging technologies, how these technologies may be used, and their personal, economic and societal implications. You will also have gained experience of using some of these technologies and understand how they are likely to develop in the future.

Assessment is straightforward and will not take much time. It might comprise a short test and a research activity or require you to maintain a log of your learning.

This Unit will provide you the opportunities to develop a number of Core Skills including *Communication, Information and Communication Technology (ICT) Numeracy* and *Problem Solving.*