

FACTFILE: GCSE DIGITAL TECHNOLOGY



Unit 1

DIGITAL APPLICATIONS



Introduction

Learning Outcomes

Students should be able to:

- describe the main features of gaming applications, simulations and mobile phone applications and how they can be used to support the following:
 - education and training;
 - social interactions; and
 - work practices; and
- evaluate the impact of the following digital applications on our everyday lives:
 - online banking;
 - online training; and
 - e-commerce.

Content

- Gaming Applications.
- Simulations.
- Mobile Phone Applications.
- Online Banking.
- Online Training.
- E-commerce.

Gaming Applications

Nowadays we associate computer games with high resolution graphics, video or even virtual reality technology. Some of the earliest computer games, however, were purely text-based. A game called Adventure, which was developed by William Crowther and Don Wood in 1977, is generally credited with being the first interactive adventure game. You can see a sample session with Adventure in Figure 1.

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Adventure
Colossal Cave by William Crowther, ported by Chris Conley
Release 2 / Serial number 130327 / Inform 7 build 6G60 (I6/v6.32 lib 6/12N)

Welcome to Adventure!! Would you like instructions?

yes

Somewhere nearby is Colossal Cave, where others have found fortunes in treasure and gold,
though it is rumored that some who enter are never seen again. Magic is said to work in the cave.
I will be your eyes and hands. Direct me with commands of 1 or 2 words.
(Errors, suggestions, complaints to Crowther)
(If stuck type HELP for some hints)

(Type ABOUT for details about this specific Inform 7 implementation.)

You are standing at the end of a road before a small brick building. Around you is a forest. A small
stream flows out of the building and down a gully.

>down
You are in a valley in the forest beside a stream tumbling along a rocky bed.

>right
I am unsure how you are facing. Use compass points or nearby objects.

>north
You're at End of Road again.

>

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Figure 1: Sample Session with Adventure

You can play Crowther & Woods' Adventure on playfic.com, where you can also create your own adventure games.

- <http://playfic.com/games/mgscox/adventure>

Clearly today's computer games are much more sophisticated than Adventure. This is due, largely, to advances in technology that have made much more powerful computers widely available, and at a much lower cost.

Games are available to be played on a variety of *platforms*, including:

- desktop computers running Windows or MacOS;

- mobile devices running Windows, Android or iOS;
- purpose designed gaming platforms such as *Microsoft Xbox* or *Sony Playstation*.

Games may be *single player* – designed to be played by one player at a time – or *multiplayer* – designed to be played by more than one player at a time. Multiplayer games include:

- World of Warcraft: <https://worldofwarcraft.com>
- Second Life: <http://secondlife.com/>

World of Warcraft and Second Life are sometimes described as *Massively Multiplayer Online Games (MMOG)* because of the vast numbers of players who can play simultaneously.

Modern games may use *virtual reality* technology to provide a more *immersive* player experience.

Virtual Reality

“*Virtual Reality* is a computer-generated environment that provides the user with the illusion of being present in that situation. Virtual reality is produced by providing feedback to our various senses: vision, hearing, movement and sometimes smell. As the user moves or acts, the image seen will change along with the appropriate sound and movement”

BCS Glossary of Computing, 13th edition, p 147.

Augmented Reality games provide the player with a modified view of the real physical world, into which computer generated content has been embedded. Augmented reality games include:

- Pokemon Go: <http://www.pokemongo.com/en-uk/>
- Ingress: <https://www.ingress.com/>

Education and Training

Inspirational game designer, Jane McGonigal, makes a compelling case that computer games have the potential to transform the world for the better. She begins by observing that across the world, “three billion hours per week” are spent “playing online games” and noting that, as a consequence of this, gamers acquire a range of knowledge and skills that are specific to the games they are playing. She speculates that, if we could design games that were engaging enough, and that helped to develop skills that were needed in the real world, then we might be able to solve many of the world’s big problems.

Jane McGonigal’s TED Talk: https://www.ted.com/talks/jane_mcgonigal_gaming_can_make_a_better_world

- World Without Oil: <http://worldwithouthoil.org/>
- Superstruct: <http://archive.superstructgame.net/>
- EVOKE: <http://www.urgentevoke.com/>

The *Institute of Play* is a US not for profit organisation that creates learning experiences based on the principles of game design. By creating games they claim to “design experiences that make learning irresistible”.

- <http://www.instituteofplay.org/>

The Institute is interested in educational uses of all kinds of games – not just computer games.

Social Interaction

It is often argued that gaming can have a

negative impact on teenagers’ social interaction and psychological well being. The feeling is that too much time spent sitting in front of a screen zapping aliens may make teenagers aggressive or turn them into poorly adjusted loners. Others respond by saying that not all games involve zapping aliens, and that online multiplayer games provide opportunities for players to *expand* their social network in ways that would not otherwise be possible. You can read a range of views on the subject below:

- <http://www.bbc.co.uk/news/health-28602887>
- <http://www.bbc.co.uk/news/technology-34255492>
- <http://news.bbc.co.uk/1/hi/technology/7619372.stm>
- <http://www.bbc.co.uk/news/education-17600454>
- <http://news.bbc.co.uk/1/hi/health/7907766.stm>
- <http://www.bbc.co.uk/guides/zcs76fr>
- <https://www.sciencedaily.com/releases/2007/09/070915110957.htm>

Work Practices

What if doing your job was just like playing a game? Well *gamification* may have the potential to make this a reality for some people. Gamification is the application of game playing elements, such as challenge and competition, into other areas of activity.

In her TED Talk, Janaki Kumar discusses the application of gamification at work.

- <https://youtu.be/6wk4dkY-rV0>

It remains to be seen whether gamification will have a significant impact in the workplace.

Gaming Resources

Game On: A History of Computer Games
<http://www.bbc.co.uk/news/entertainment-arts-36934819>

Lessard, J. Adventure Before Adventure Games: A New Look at Crowther and Woods' Seminal Program, Games & Culture, Vol. 8, Issue 3, 2013.

<http://journals.sagepub.com/doi/abs/10.1177/1555412012473364>

BBC Bytesize, What Makes a Good Computer Game <http://www.bbc.co.uk/guides/zw96tfr>

Simulations

This BBC news story reports on an app that helps trainee medical staff to improve their surgery skills.

- <http://www.bbc.co.uk/news/technology-32844630>

Trainees use the app to manipulate a 3D animated model of the relevant human anatomy. They can step through a range of surgical procedures and receive feedback on their performance. This is an example of a computer simulation.

Computer Simulation

“*Simulation* is the use of a computer program to predict the likely behaviour of a real-life system”

BCS Glossary of Computing, 13th edition, p 106.

Other widely used applications of simulation include *weather forecasting* and *pilot training*.

Meteorologists use computer simulations to predict the weather. Their simulation software contains a mathematical model of how atmospheric conditions around the world interact to produce the weather we observe, and how this evolves over time. Starting with a detailed record of atmospheric conditions today, the software can predict what the weather will be tomorrow.

Trainee pilots often gain experience using a flight simulator.

- <http://www.bbc.com/future/story/20160106-the-airliner-flight-sims-that-can-save-lives>

The simulator consists of a collection of software and hardware that is intended to create a virtual environment that is as close as possible to an actual flight control deck. Simulators have the advantage of enable trainee pilots to be put into difficult situations – situations that would be dangerous if they took place in the real world.

Education and Training

We have already seen two applications of simulation in education and training: surgical training and pilot training. In both of these areas there is an obvious advantage in giving trainees a virtual environment where mistakes can be made without endangering anyone.

Social Interaction

Computer simulation can be a powerful tool in helping us to understand how social interaction and the spread of diseases are related.

- <https://blogs.scientificamerican.com/guest-blog/simulating-the-spread-of-disease/>
- <http://www.shodor.org/interactivate/activities/SpreadofDisease/>

Work Practices

Weather forecasts are relied upon in industries that include: farming, fishing, aviation. Indeed accurate weather forecasts can be safety critical at sea and in the air.

Simulation Resources

BBC Bitesize: Computer Simulation

<http://www.bbc.co.uk/education/guides/zw96tfr/revision>

Mobile Phone Applications

The Guardian reports that global mobile web browsing overtook desktop web browsing in October 2016.

- <https://www.theguardian.com/technology/2016/nov/02/mobile-web-browsing-desktop-smartphones-tablets>

Many organisations now adopt a *mobile first* strategy to development – this means that they focus their development efforts firstly on mobile devices and only afterwards on desktop applications. The range of mobile phone applications (or apps) that is now available is vast, and continues to grow. There are too many to even attempt a list – indeed any list would soon be out of date. Statista reports that (at of June 2016) there were 2,200,000 apps in Google Play Store.

- <https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/>

Google Play Store lists (at January 2017) more than 50 categories of app, including: Android Wear, Business, Dating, Medical, Parenting, Simulation Games, Education – and many more. Some of these applications are really only possible on a mobile device – e.g. activity trackers don't make sense on a desktop PC. Other applications are made much more useful because they offer both desktop and mobile access. For example, Google Calendar enables you to save, view and organise all appointments.

The Mobile Application Business

Anyone who has developed a mobile app may make it available on an App Store. There is currently a registration fee for both Google Play and iOS app stores, and a review process, which is intended to filter out low quality apps. These are not, however, significant obstacles.

App developers have a number of options to profit from their app, including.

- Pay to download;
- In-app advertising;
- In-app purchases.

Pay to Download: Many apps are free to download and most of those that are not, are relatively inexpensive. Statista reports that (at April 2013) the average price of an iPhone app was \$0.19 – and of an Android app, was \$0.06.

- <https://www.statista.com/statistics/262387/average-price-of-android-ipad-and-iphone-apps/>

In-App Advertising: Many apps are designed to display advertisements during use. This has become known as *in-app-advertising*. In-app advertising is sometimes enhanced by location data to ensure that users are presented with advertisements at a time and place where they are able to make a relevant purchase.

In-App Purchase: Many apps are designed to encourage the user to make an additional purchase whilst using the app. These have become known as *in-app purchases (IAP)*. Often these IAPs are built into games and enable the user to buy additional game resources or gain access to additional levels. The use of IAPs has become quite controversial as

users report making purchases that they had not intended – this has been a particular problem where children are concerned. It is now possible to disable in-app purchases in both Android and iOS apps.

Education and Training

Statista reports that (In December 2016) 8.55% of the apps in the iOS App Store were classified as educational.

- <https://www.statista.com/statistics/270291/popular-categories-in-the-app-store/>

Browsing the *educational* category in Google Play Store I can see apps to help learn:

- computer programming languages such as Python, Java and C#;
- school subjects such as biology and mathematics;
- modern languages such as French and Spanish.

In addition to subject specific learning apps there are apps that enable access to more generic learning tools and services, including *virtual learning environments (VLE)* such as *Blackboard Learn, Moodle and Google Classroom*.

A *virtual learning environment (VLE)* is a web-based platform designed to support a range of educational activities, which might include communication and resource sharing, as well as assessment and feedback.

Social Interaction

The debate about the effects of computer technology on human behaviour did not start with mobile computing. It is clear, however, that smartphone use has greatly increased the opportunities for any such effects to take place. It has been argued that this is having a negative impact on our social relationships. It is not, for example, uncommon nowadays to see a group of friends all looking down at their own phones, rather than communicating with one another. In this BBC interview, Professor Susan Greenfield discusses some of these issues.

- <http://www.bbc.co.uk/news/technology-22283452>

Not everyone agrees with Professor Greenfield, and it is clear that mobile computing often enables social interaction. For example, many of the apps

that we use on our phone (e.g. WhatsApp, Facebook) are specifically intended to enable and support interaction. In many cases our mobile phones enable social interaction that would be otherwise very difficult. For example, we can have (Skype) video conversations with friends and family at the other side of the world.

You can read a range of viewpoints on these issues here:

- <http://www.bbc.com/future/story/20150310-are-you-over-connected>
- <http://www.telegraph.co.uk/technology/8458786/The-young-generation-are-addicted-to-mobile-phones.html>
- <http://www.telegraph.co.uk/technology/news/9714616/Mobile-phone-addiction-ruining-relationships.html>
- <http://www.bbc.co.uk/news/health-29569473>
- <http://www.bbc.co.uk/news/technology-16313832>
- http://www.huffingtonpost.com/2014/10/17/technology-changing-relationships_n_5884042.html

Work Practices

Generic mobile apps such as email and calendaring are widely used in the workplace. In addition to this there is also a range of more industry specific apps. For example:

- Medicine: <http://blog.capterra.com/top-7-medical-apps-for-doctors/>
- Engineering: <https://www.asme.org/engineering-topics/articles/technology-and-society/5-mobile-apps-for-engineers>

Online Banking

Online banking, also known as *internet banking*, enables you to access your bank account from any connected desktop computer or – increasingly – from any connected mobile device. In the latter case this is known as *mobile banking*. You can open/close accounts, check account balances, transfer money between accounts, pay bills – and do most of the things that you would expect to be able to do at your local high street bank.

- The advantage to the customer is that they have the flexibility to access to their account 24 hours a day, 7 days a week – and with mobile banking, this can take place from any location.

- The advantage to the bank is that it costs much less to provide online services than to provide face-to-face service in a bricks and mortar, high street bank.

Of course, online banking also brings risks.

- **Breach of the Bank's Security:** No matter how hard a bank tries to secure its online systems, there is always the possibility of this security being breached by criminals.
- **Breach of the User's Security:** While your online bank account is protected by passwords and PINS, this is only effective if you look after these properly.
 - If you write your password down, it may be found and used to gain unauthorised access to your account.
 - If you use the same password for your bank account that you use for some other service, it is possible that security at the other service may be breached. If this happens then the security of your bank account will also be compromised.
 - Certain kinds of malware are specifically designed to capture any passwords that you type into your computer. These may present a risk to the security of your bank account.
- **Breach of Network Security:** It is possible, on insecure networks, for messages to be intercepted and this provides opportunities for criminals to access banking passwords. This is a particular risk when using public Wi-Fi.

The good news is that, in the UK, if your bank account is hacked then the bank will be responsible for any losses – providing that you have taken proper care of your passwords. The customer should not lose any money.

Exercises

1. Given the risks that are inherent in online banking, what precautions should you take to make sure that your account is as secure as possible.
2. Search the web for news reports of breaches to the security of banking systems. In each case, identify whether any losses were borne by the bank or the customer.
3. Browse the websites of any two UK internet banking providers. Create a table comparing the range of services that each offers to its customer.

Online Training

We have already seen how computer simulations are used in the training of surgeons and pilots. Computer-based training, in a more general form, is used much more widely than this. The following Google search gives some indication of the variety of this important area of activity.

- <https://www.google.co.uk/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=online%20staff%20training>

Online training offers a number of advantages, including the following.

- **Reusability:** Once a learning resource has been created it can be used many times with little additional cost. This compares favourably with the cost of face-to-face training, whereby one or more human trainers must normally be present each time a resource is used.
- **Accessibility:** Online training can take place at a time and location that is convenient for the employee, and allows learners to progress at their own pace.
- **Environmentally Friendly:** Online learning can be more environmentally friendly because employees do not have to travel to participate. There may also be a reduced need for paper documentation as materials can be viewed online.

It should also be noted, however, that some learners feel that online learning experiences are not always as effective as face-to-face ones.

Exercise

Describe an experience that you have had with online learning. Say whether you found it enjoyable and effective – give your reasons.

E-commerce

There can be few of us who have not bought an item online. Whether we are looking for books, music, travel or groceries there are many online sellers who want to fulfill our needs. From Amazon to eBay; from Tesco to easyJet; we can find what we are looking for and complete a purchase within minutes – 24 hours a day, 7 days a week. This is *e-commerce*.

E-commerce

“*E-commerce* is the use of the internet for ordinary commercial tasks such as retail sales and publishing.”

BCS Glossary of Computing, 13th edition, p 127.

There are risks for users of e-commerce services.

- How secure are your payment details?
- Will you receive the item you have paid for?
- What are your rights if the item you receive is defective?

You can find advice below on how to minimise these risks.

- <http://www.bbc.co.uk/webwise/0/22728224>

The public are aware of online retailers, such as Amazon and eBay, because their business models involve dealing directly with the public. These are known as *business to consumer (B2C)* businesses. There are many, lesser known, e-commerce business that do business with other businesses, rather than with the public. These are known as *business to business (B2B)* businesses. An example of a successful B2B business is Salesforce, who provide a range of cloud-based services to businesses.

- <https://www.salesforce.com>

Exercises

1. Collect, from friends, family and classmates, stories of internet purchases that have been disappointing or unsatisfactory. Describe their experiences in a few bullet points. In each case say what you think the person involved might have done differently to protect themselves.
2. Online retailers, such as Amazon, provide opportunities for customers to leave feedback on their experiences on using the service. Do you think these are a useful resource for future customers? Do they have any limitations? Explain your answers.

