Animation is a fast-growing and exciting area of ICT. In the past, animation was mainly used for television cartoons and animated movies, but it can now be found on the Internet, mobile phones, in advertising and computer games.

At all stages of animation development, you need to consider the audience, as they are the people who you want to watch (and maybe even pay to watch) your animation. The audience is especially important if you want to convey a message such as give information or persuade them to buy a product.

This unit will allow you to be very creative and use your imagination. You will be able to develop good visual awareness and attention to detail – these are useful skills not only for this unit, but for any work you do. In addition, you will have opportunities to develop and improve skills such as time management, organisation and carrying out a complete project.

Learning outcomes
After completing this unit you should:
1. know about animation techniques
2. be able to develop ideas for an animation sequence
3. be able to create an animation sequence
4. be able to review your own animation production.
Assessment and grading criteria

This table shows you what you must do in order to achieve a pass, merit or distinction grade, and where you can find activities in this book to help you.

<table>
<thead>
<tr>
<th>To achieve a pass grade the evidence must show that you are able to:</th>
<th>To achieve a merit grade the evidence must show that, in addition to the pass criteria, you are able to:</th>
<th>To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, you are able to:</th>
</tr>
</thead>
</table>
| **P1** outline techniques employed in animation  
   *See Assessment activity 30.1 on page 12* | **M1** describe techniques employed in animation with some detail and with reference to appropriate illustrative examples  
   *See Assessment activity 30.1 on page 12* | **D1** evaluate techniques employed in animation with reference to precise and detailed illustrative examples  
   *See Assessment activity 30.1 on page 12* |
| **P2** present an idea for an animation sequence  
   *See Assessment activity 30.2 on page 20* | **M2** present a developed idea for an animation sequence  
   *See Assessment activity 30.2 on page 20* | **D2** present an imaginative idea for an animation sequence  
   *See Assessment activity 30.2 on page 20* |
| **P3** use animation techniques to create an animation sequence that partially realises intentions  
   *See Assessment activity 30.3 on page 26* | **M3** use animation techniques competently to create an animation sequence that mainly realises intentions  
   *See Assessment activity 30.3 on page 26* | **D3** use animation techniques skilfully to create an animation sequence that clearly realises intentions  
   *See Assessment activity 30.3 on page 26* |
| **P4** review strengths and weaknesses of own animation production work  
   *See Assessment activity 30.4 on page 31* | **M4** describe strengths and weaknesses of own animation production work with some detail and with reference to appropriate illustrative examples  
   *See Assessment activity 30.4 on page 31* | **D4** evaluate strengths and weaknesses of own animation production work with reference to precise and detailed illustrative examples  
   *See Assessment activity 30.4 on page 31* |
How you will be assessed

This unit is internally assessed. You will provide a portfolio of evidence to show that you have achieved the learning outcomes. Your portfolio of evidence can be supplied in many formats including electronically as well as paper-based. The grading grid in the specification for this unit lists what you must do to obtain pass, merit and distinction grades. The Assessment activities in this unit will guide you through tasks that will help you to be successful in this unit.

Your tutor will tell you exactly what form your assessments will take, but you could be asked to produce:

- research notes
- a report, in the form of a written document, short video or audio
- a proposal
- pitch slides and notes
- design documentation for your own animation
- practical work
- notes on audience responses
- all planning documentation for your animation (notes, ideas boards, spidergrams, sketches, photographs, designs and storyboards)
- tutor observation and witness statements
- a review, in the form of a written document, presentation or short video.

Lizzie Parsons, student of animation

This was a brilliant unit. I learned loads of new skills, not just in animating but in how to carry out a project.

It was fascinating to find out about the whole field of animation. I thought I knew a bit about animation and I’d seen lots of television cartoons and animated movies, but there was so much more to learn and it was really interesting.

I loved coming up with an idea and then putting more thought into it to produce a full design, and then actually creating the animation. I enjoyed using my imagination. I’ve never thought of myself as creative, but when we started using the design tools, such as spidergrams and storyboards, I found I was able to come up with fresh ideas.

I thought the review part at the end of the project might be a bit boring, but it was actually really interesting. Rather than just finishing when the animation was made, it was nice to reflect on what I had done and make sure my product met the original design and was suitable for the audience. It was also really great to get feedback from the audience. I found it reassuring that they generally liked it, and they also pointed out really interesting ways in which I could improve my animation.

Over to you

- Which parts of this unit do you think you will enjoy?
- Which areas might you find more challenging? What might you be able to do to develop your ability in these areas?
- What do you think goes into making an animation? Make a list of five important skills an animator might need.
1. Know about animation techniques

There are a variety of techniques for animating which are available to you, some traditional, some new, ranging from hand-drawn to digital.

1.1 Techniques

By developing an understanding of the different ways of creating animation, you can begin to make a decision about which will be the best for each product you make. We’ll start by looking at some of the first animation techniques before looking at more recent developments.

Zoetrope

The zoetrope was a device popularised in the Victorian era for entertainment. It demonstrates how animation is a sequence of images viewed over time. A circle of paper with drawings on was used, each drawing slightly different from the previous one. This paper was placed in the zoetrope, which had small slits around the outside. When the zoetrope was spun round, the pictures would pass each of the slits at speed, creating the illusion of movement.

You can see a video of a zoetrope animation called *Cycle of Life* as well as an example of an original zoetrope by going to Hotlinks and clicking on this unit.

Kinetoscope

The kinetoscope was invented by Thomas Edison, who also invented the lightbulb and the phonograph. The kinetoscope machine could be loaded with a sheet of perforated film which, when moved over a light, gave the impression of moving images. This was the forerunner of modern film projection, such as the type which is used in cinemas today, although this is being overtaken now by digital film. You can see an example of a kinetoscope by going to Hotlinks and clicking on this unit.

Flick book

A flick book (also known as a flip book) is a very simple type of animation. Several pieces of paper are used, usually long and narrow. At the end of each page a drawing is made, starting from the back, as when it is viewed the images are seen from back to front. On each page moving forward through the book, the drawing is slightly different. Once completed, the book can be flicked through and, because the images are moving past your eyes at speed, the drawings give the illusion of movement. Various examples of flick books can be found on YouTube; you can see one such example by going to Hotlinks and clicking on this unit.

Did you know?

The illusion of movement by images changing at speed is the foundation of all animation and has still not been definitively explained by science. Find out more in the case study ‘How does animation work?’ on page 7.
Cel animation (drawn on film)

Celluloid is film which is made up of a line of cels. Each cel is clear and the rest of the film is black – see Figure 30.1 on the right.

For cel animation, each picture is drawn onto a cel. As with the other animation techniques we’ve looked at, each picture is different from the last. When the film is run at speed over a light, the images are projected and give the illusion of movement.

The simplest method is to paint the whole image onto the cel. A different method is where several layers are used for each part of the picture (e.g. background, characters) and they are laid on top of each other. This means that the background layer can stay the same over several cels and only the characters have to be moved when painted on to each cel.

Each picture in a cel can be drawn with a great level of detail, but this method is incredibly time-consuming. This was the main method used for both television cartoons and animated movies until computer animation became popular.

Rotoscoping

Rotoscoping is where live actors are filmed and the animation is then created using them as a template. In traditional animation production, the filmed images are traced by hand onto a separate roll of celluloid film. This technique makes the movement of characters more realistic and was used in Walt Disney’s Snow White and the Seven Dwarfs (1937).
Rotoscopying is also used in digital animation – actors are connected to a computer and their movements are captured and turned into a skeleton. The computer then maps the animation to the skeleton and the character is created. This technique is also known as performance capture and was used in The Polar Express (2004) and Avatar (2009).

Digital applications

As digital technology has improved, both for creating animations and watching them, it has become increasingly popular for use in animation. Toy Story (1995) was the first major animated movie to be made entirely using computer animation, and the trend has continued to develop from that point. Animations which are made for the Internet and computer games are also created using digital programs.

There is a wide range of software on the market for creating digital animations. Adobe® Flash® is a relatively simple and cheap 2D, cartoon-style animation program. For 3D animations, Blender is effective but still straightforward to use and is also free. More complex, powerful software includes 3ds Max and Autodesk® Maya®.

Activity: Digital animation styles

Find five very different examples of digital animation and compare their styles. Try to include some simple 2D Flash animation, complex 3D animation and CGI with live action (for example, the character Gollum from the Lord of the Rings trilogy).

Key term

CGI – Computer Generated Imagery uses animation mixed with real footage.

Photographic stills

Instead of drawing the images, by hand or on computer, animators can use photographs, each one a little different from the one before it. Again, when viewed in order at speed, the photographs give the impression of movement. The pictures could be just photographs or photographs with pictures drawn onto them which are slightly different each time.

Stop frame

Stop frame animation is where an image or a real-life scene is captured by a camera. This could be a stills camera or, more usually, a video camera recording for less than a second each time. For each image, the scene is changed very slightly. In this way, the sequence of images creates the impression that the scene is moving. The shorter each of the captured images and the smaller the movements each time, the smoother the animation.

Good examples of this technique include The Nightmare Before Christmas (1993) and Coraline (2009). Another interesting animation
Claymation is a particular type of stop frame animation. Models are made and the scene is captured with a camera. After each picture is taken, the models are moved a tiny bit and eventually, when the images are all viewed together, it can appear that the models are really moving. Aardman Animations are leaders in this field with their Wallace and Gromit series of short and feature-length films.

Case Study: How does animation work?

Animation gives the illusion of one smooth continuous moving picture, but in reality it is a series of images being viewed at speed. So how does it work?

There is a theory called persistence of vision that states that the human eye will retain an image it has seen for a brief moment. Therefore, when many images are passing the eye, the eye retains each one and the brain interprets it as a continuous image. Each image is seen for less than a millisecond and is travelling at the speed of light.

A second theory called beta movement says that it is not the eyes that give the illusion of movement, but the brain. When two identical images are shown in rapid succession, the brain imagines the movement between them. For example, in a classic experiment, test subjects were shown a circle appearing at the left of the screen followed by one at the right several times quickly. Afterwards they described seeing the circle moving from side to side.

To demonstrate these theories, you can create a game that was developed in the Victorian era, when animation was beginning to become a popular pastime. The thaumatrope is a circular card attached between two strings with an image on each side of the card. When you twist the strings around many times and then pull on them, the card spins round quickly.

To make a thaumatrope:

- Take a circle of white card and draw a picture of a bird on one side and a birdcage on the other. (You can use other images, but this is the classic example.)
- Make a hole at two opposite sides of the card, near the edge. Tie a loop of string through each hole.

To see a video of a thaumatrope in action, go to Hotlinks and click on this unit.

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Did you know?

To see a video of a thaumatrope in action, go to Hotlinks and click on this unit.

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Figure 30.1: The two sides of the thaumatrope.

- Wind up the device by holding the ends of the strings and flipping the card over and over to twist the strings.
- Now pull on the ends of the strings and the card should turn over and over as you keep pulling.

1. What happens to the bird and the cage of your thaumatrope?
2. What happens when you speed up the thaumatrope or slow it down?
3. How does this game relate to frames per second (see page 18)?
4. If you find this interesting, also research the uncanny valley. This is a theory which states that eventually we will create animations of humans which are so realistic we will be unable to watch them.
1.2 Influential animation

There have been many people and companies who have influenced animation and developed it further. In this section, we will look at some of the most influential.

Walt Disney

Walt Disney and the Walt Disney Studios have played a pivotal role in the progression of animation. Walt Disney's first major creation was Mickey Mouse, the star of animated shorts such as *Steamboat Willie* from 1928, and still a popular character and cultural icon today. Disney went on from this to make feature-length animated movies, starting with *Snow White and the Seven Dwarfs* in 1937. The Walt Disney Studios joined with Pixar in 2006, and the combined studios continue to produce films including *WALL-E* (2008) and *Up* (2009).

Walt Disney was a visionary who not only changed the face of animation, but also created Disneyland, a theme park in California based on the creations of his studios. The Disney theme parks have been replicated around the world, including Disneyland Paris.

Hanna-Barbera

William Hanna and Joseph Barbera were leaders in the field of television cartoons. The company Hanna-Barbera was launched in 1957 and ran until it was absorbed into Warner Bros in 2001. Hanna-Barbera specialised in animated television cartoons, including classics such as *Tom and Jerry*, *Scooby-Doo!, The Flintstones* and *The Smurfs*. All of these are still popular and have been developed further, including feature-length live-action movies. The studio’s more recent productions include *Johnny Bravo* and *The Powerpuff Girls* for Cartoon Network.

Hanna-Barbera was one of the first animation studios to produce cartoons for television and introduced the custom of children's television on Saturday mornings.

Warner Bros

As well as producing live-action films and television shows, Warner Bros (pronounced Warner Brothers) also has a branch of the company specialising in animation. In the 1930s they created *Looney Tunes* and *Merry Melodies*, giving us characters such as Bugs Bunny, Porky Pig, Taz, Daffy Duck and Tweetie Pie.

Pivotal animations to see in their series of shorts include *What's Opera Doc?* (1957) and *Duck Amuck* (1953). These cartoons contributed to the development of animation by treating it as a medium for grown-ups. They featured many innovations, such as classical music (using syncopation of singing and mouths), parody, humour and dramatic lighting. In *Duck Amuck*, the character 'breaks the third wall' by speaking directly to the audience (as he argues with the animator).
As well as shorts, Warner Bros have produced some feature films. Their most financially successful feature-length films include *Space Jam* (1996), where the basketball player Michael Jordan stars opposite classic Warner Bros cartoon characters.

**Norman McLaren**

Norman McLaren (1914–1987) was an experimental animator from Scotland who developed new techniques, especially for synchronising animation and sound. A lot of his work was abstract, such as *Dots* (1940). He led the way for future animators to align sound and visuals using the methods he developed.

**Activity: Dots by Norman McLaren**

Watch *Dots* (1940) by Norman McLaren by going to Hotlinks and clicking on this unit.

- What comparisons can you make between this animation and modern film-making?
- Can you see any elements which were later used in music videos and computer games?

Remember that this animation was all done by hand – computers weren’t around when it was made!

**Len Lye**

Len Lye (1901–80) was another experimental animator, this time from New Zealand. He was interested in sound, motion and kinetic sculpture (art which moves). He created abstract works such as *Free Radicals* (1958–79), which was made by scratching the celluloid film.

His work demonstrated various methods of movement across the screen, which subsequent animators were able to develop in interesting and different ways.

**Activity: Free Radicals by Len Lye**

Watch *Free Radicals* by Len Lye by going to Hotlinks and clicking on this unit.

- What comparisons can you make between this animation and modern film-making?
- What techniques has the animator used? Consider sound, movement, **perspective** and rhythm.

**Key term**

**Perspective** – the illusion of distance, creating a 3D effect even though it appears on a 2D screen.
Table 30.1: Contemporary uses of animation.

<table>
<thead>
<tr>
<th>Type of animation</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music videos</td>
<td>Animation is used in many music videos, often in combination with live action.</td>
<td>Stop frame animation examples include:</td>
</tr>
</tbody>
</table>
|                   |             | • *End Love* by OK Go (2010)  
|                   |             | • *Her Morning Elegance* by Oren Lavie (2009) |
| Advertising       | Animation used in adverts can range from the whole thing being entirely animated to just a small part being given a feeling of fantasy or ‘the impossible’ from seamless CGI. | *Citroën C4* (2004)  
|                   |             | • *Cadbury’s Crunchie* (2010) |
| Television programmes | Children’s cartoons are a staple of television programming. Cartoons for adults have also become popular, including *South Park* and *Family Guy*. | *Ben 10* from Cartoon Network (2008) |
| Computer games    | Animation is crucial to computer games, as it provides the visual elements of the games. As technology has developed, the graphics and animation have improved to the point where they are incredibly realistic and detailed. | *Ghostbusters: The Video Game* (2009) |
| Mobile phones     | The capabilities of mobile phone technology have developed rapidly in the last few years to include full-colour, high-resolution screens, especially on smart phones such as the Apple iPhone. Not only are the interfaces animated, but applications are being made purely as pieces of animation for entertainment. | *Talking Carl – app for iPhone* (2010) |
| Internet          | The Internet provides a vast forum for animators to show their work, including pieces of art, adverts and animations that have been embedded seamlessly into websites. This opens up a huge audience worldwide and allows animators to communicate with each other and share ideas.  
Although most animations are available to view for free, the Internet has allowed some professional animators, such as Monkeehub, to become well known and successful. The Internet also provides space for amateur animators to create animations purely for the love of doing it and to tell a story.  
The advent of Adobe® Flash® has given a visual voice to those who may have never considered animation before. | Music video for ‘Creep’ (Radiohead) by Monkeehub (2007) |
Aardman Animations are primarily a claymation studio. They have created the classic characters Wallace and Gromit, who have starred in a number of shorts, including *The Wrong Trousers* (1993), and a feature-length film *The Curse of the Were-Rabbit* (2005). They have also created the series of shorts *Creature Comforts* (1989–present), the television series *Shaun the Sheep* (2007–present), the film *Chicken Run* (2000) and collaborated with DreamWorks Animation to make *Flushed Away* (2006).

Aardman Animations have brought claymation and stop frame animation into the popular domain and been hugely successful. To visit their website go to Hotlinks and click on this unit.

### 1.3 Contemporary uses

Animation is used in many ways in modern life, and you will probably encounter it more times per day than you realise. Some of the main contemporary uses are shown in Table 30.1; to see the examples listed in the ‘Examples’ column, go to Hotlinks and click on this unit.

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### Activity: Uses of animation

For each of the examples listed in Table 30.1 on the previous page, watch the animation very carefully (to access each example, go to Hotlinks and click on this unit) then describe:

1. the techniques that have been used
2. the audience it has been made for
3. the purpose of the animation
4. how effective you think the animation is.

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### Just checking

1. Describe how a zoetrope works.
2. How does the zoetrope illustrate how animation works?
3. What is rotoscoping?
4. How does stop frame animation work?
5. Name three important animators and give examples of their work which are not listed in this unit.
6. Give five examples of how animation is used, giving your own examples.
2. Be able to develop ideas for an animation sequence

When you are making an animation, designing it first is absolutely essential. This is the stage where you can plan what will happen, how long the animation will be, who it is for and how you will actually create it. Always remember to design thoroughly because the more effort you put in at this stage, the easier it will be to make your actual animation. Keep a notebook and pencil with you at all times so you can sketch or jot down any ideas which come to you that you may want to use in your animations later.
2.1 Considerations

There are certain elements which you need to consider when planning your animation. Thinking about each of these before you begin designing and creating your animation will help to give it focus and meaning. It also means that you will begin your design with a really clear base on which to build your other ideas.

**Audience**

The first things to consider are:

- who are the people who will be viewing your animation?
- who would you like to attract to see it?

It is impossible to make a product which appeals to everyone, as people have such different tastes and interests and that is what makes society interesting. Therefore, you need to select a portion of the population, for example, teenagers aged 13–15 years or women aged 60+, to whom you will target your animation.

Your choice of audience will influence the design and development of your animation. For example, if you are making a television cartoon for young children, you will probably use bright colours, happy music and simple language. For an animated short or feature-length film, you need to consider a strong storyline and character development that the audience can believe in or empathise with. Alternatively, for an advert, something catchy is often desirable so viewers are persuaded to buy the product.
Technique

The next consideration is: What animation techniques will you use to create your animation?

Look at the techniques discussed on pages 4–7. You might choose a technique for different reasons, perhaps because a certain technique will have the greatest impact on the audience, or it follows a current trend or because you have the skills needed to use this technique. Time may also play a factor in your decision, as some methods take longer to create than others.

Style

You also need to consider: What will be the style of the animation? Generally the style should be consistently used throughout the whole piece. The two areas of style you need to consider in your animation are visual style and storytelling style.

Visual style

What visual effects do you want to create? There are many different styles of cartooning, such as the black-outlined figures in *The Powerpuff Girls*, the flat 2D-style of Flash\textsuperscript{®} animations and the distinctive style used in Japanese anime.

Storytelling style

Will your animation be straight or comical? Straight means that it is serious and not designed to be funny. Your animation might be telling a scary story or giving important information.

Animation is a good medium for fantasy stories, as there are no limitations to the weird and wonderful characters and events which you can create on-screen. Comical animations might include spoken jokes, slapstick or be entirely based around a humorous situation. Satire could be used for comedy.

Key terms

- **Anime** – a distinctive style of animation which originated in Japan. Characters usually have elongated limbs, large eyes, big hair and exaggerated facial expressions.
- **Satire** – a method of comedy using sarcasm to make fun of a person’s follies or a feature of society.
- **Genre** – a category used to group films or animations of a certain type. With each genre there are a set of ‘rules’. For example, a Western or cowboy animation usually uses a palette of mostly yellow and browns, has traditional settings such as a desert or saloon, and is based on a fight between good and evil.
- **Conventions** – elements that are normally found in a certain genre, e.g. in fantasy there are often fictional types of animals, imaginary countries, use of magic, etc.

Activity: Anime

Anime is a hugely popular variety of animation, not just in Japan but across the world. Try to watch some anime, especially from the influential Studio Ghibli, such as *Spirited Away* or *My Neighbor Totoro*. Make notes on the similarities and differences between this style and British and American animation.

2.2 Genres

The **genre** is the type of animation, such as fantasy, horror or comedy. Each of these genres has a set of **conventions**, for example in horror...
the animation will be dark, will use a limited number of colours and will use suspense or shock to frighten the audience.

The genre can also describe the purpose or audience of the animation, for example children’s cartoons, music videos and advertisements.

2.3 Generation of ideas

Inventing new ideas is very difficult. Sometimes a new idea can come in a flash of inspiration, but sometimes animators have to work on developing a new idea over a period of time.

Activity: One object, many purposes

Take an everyday object, such as a paperclip or a box, and invent twenty new purposes for it. Try to be as imaginative as possible.

Visualisation

Visualisation is the first stage in generating new ideas. It involves imagining what your animations will look like. Visualisation is followed by transferring the ideas from your imagination into something real. This can be as simple as sketching your ideas on paper or on-screen.

Characters

Characters are essential if you want your animation to be compelling, to tell a story and to engage your audience – they will want to see what happens to the characters. Characters could be people, animals or inanimate objects that have come to life. You may want your audience to like them or hate them, or you may want them to identify with them, so they see themselves as that character.

Think about how your characters will be dressed, as this can give instant visual clues about who they are. For example, uniforms can show what job a character does; whether the clothes are neat or untidy can show what type of person they are; dark or colourful clothes can also give an insight into the character’s personality.

Backgrounds

Once you have designed the characters, you need to create the world that they exist in. This could be as simple as a single room, as normal as a street of houses or as fantastical as a faraway land or imaginary place.

The background can tell parts of the story so you do not have to say it in words. For example, if your character is a young person in school uniform and the background to the animation is a school, the audience
immediately knows the context of the animation and some basic facts about the character, such as their approximate age.

**Storylines**

Animations will usually have a storyline, even if they are very short. They usually have a beginning, middle and end; for example, in Cinderella the beginning is when she is told she can’t go to the ball, the middle is when the fairy godmother allows her to go to the ball and the end is when the prince discovers she is the owner of the glass slipper left behind at the ball.

Some stories mix these sections up to create a more complex tale. For example, in ‘Who Shot Mr. Burns?’ (1995), which is a double episode of *The Simpsons*, the story is told through flashbacks from different suspects who may have shot the unpleasant nuclear power plant owner Mr Burns.

Stories often have a twist near the end, to surprise the audience so that they cannot predict how the story will end.

Usually the characters will develop through the animation, even if it is a short. The animation may start with the character having a problem (e.g. a woman has lost her umbrella), then the character goes through certain steps to try to solve the problem (she looks everywhere for it), the problem can then be resolved (she finds it) and there is usually some sort of payoff for the character (the woman goes outside to join her child playing in the puddles).

**Audio**

Sound is important in animation and is the element that really brings it all to life. There are three different types of audio: speech, music and sound effects.

If you are using speech, you will need to decide who will perform the voices. You will also have to decide if you will try to synch the audio with the characters’ moving mouths (which is very tricky) or if you will use another device, such as only characters off screen will speak or the faces will be hidden.

Music can add atmosphere to an animation but you need to choose it carefully to make sure it creates the effect you want. Go to Hotlinks and click on this unit in order to have a look at how the animator Cyriak uses music in *Cycles* and *Meow mix*.

Sound effects add depth and realism to the animation. Good sound effects should be heard but not really noticed, as though they are naturally part of the action of the animation, such as footsteps or doors shutting.

**Working within technical limitations**

No matter which animation technique you choose to use, there will always be limitations. For example, it’s very difficult to get the
smoothness of computer animation using hand-drawn techniques. But you need to be careful regarding the file size of digital animations, as websites with big animations will be very slow to load. DVDs are also limited in size. Some programs allow you to create 3D animations, but others only allow 2D animations, which can look unrealistic and cartoony.

One of the main limitations you will have to work within is the limitation of time. Animation is a very time-consuming process and, as it can be very absorbing and enjoyable, time can easily run away with you. Always be aware of the amount of time you realistically have and plan to create something ambitious but achievable.

2.4 Development of ideas: creating a design

Once you have decided on the main ideas you want to use, you can begin to use formal design methods to realise them. This is where you can really begin to make decisions about the different parts to your idea, such as your characters and backgrounds.

Drawings

Sketches are a very good way to quickly get your ideas down on paper. These do not have to be neat, but should just show your initial thoughts. Once you have done some rough sketches, you can produce more complete drawings of the characters, background and objects that will appear in your animation. These do not have to be works of art, but they do need to contain enough detail so that the characters, backgrounds and objects for your animation can be created from them. The drawings might also have annotations of size, colours, how characters will move, etc.

Storyboarding

A storyboard is a grid of squares which contain pictures of key moments in the animation in sequence. This design technique allows you to plan out exactly what will happen throughout your animation. The pictures could be drawings (simple or detailed), photographs or a combination of the two.

Adding annotations is useful to explain what movements will be happening, any speech or other audio that will be used, and any other details which will help to create the animation. For an example of a storyboard, see Figure 26.2 on page 376 of Unit 26: Developing computer games.

Consideration of movement

In your designs, you need to consider how and when the animation will move. You need to decide how your characters will move around the screen. For example, will they hop stiffly like the characters from
South Park or will they walk by moving their limbs like The Simpsons? Think about whether your characters will blink and about how they will talk.

You will need to decide whether the background will move as well. For example, if the background includes water, will the water be moving or still while other action takes place?

**Continuity**

Remember that the animation is one whole piece so there should be continuity throughout. You may find yourself working on different scenes separately and out of order, so make sure your storyboard gives details, such as the colour of the characters’ clothes or the weather in the background. When you join up all the different scenes, these details should look the same so they don’t distract the audience from the story.

**Frames per second**

A frame is one moment in an animation. Originally a frame referred to a cel on a roll of celluloid film, but frames are also used in digital animation programs. Frames per second (fps) means the number of frames which are seen during a second. The higher the frame rate, the better the quality of animation (there is less stutter and the movement appears smoother). But remember, a high frame rate needs more images (if hand-drawn) or creates a larger file size (for digital animation).

Web animations can run at 12 fps or, for higher quality, 15 fps. Television cartoons, especially hand-drawn ones, are often 24 fps, but they will be drawn ‘on twos’, which means that each image is shown for two frames and only 12 images per second are actually needed. The frame rate switches to ‘on ones’ (one image per frame) for more detailed action scenes.

Some television cartoons which have to be produced for a regular weekly slot are made ‘on threes’ or ‘on fours’ – this reduces the quality of the animation but speeds up the process of creating it. High-quality or cinematic animations are often 24 fps or 30 fps.

There is no standard for choosing the frame rate of an animation, so you need to choose the one that is best for your purpose and audience.

**Perspective**

Perspective refers to the way distance is seen – objects closer to you appear larger than objects that are far away. Bear this in mind while you are designing your animation. Unless you want your animation to look flat and unrealistic, you should make use of perspective. For example, a road which runs to the horizon should get narrower until it disappears. If your character is driving away along that road, you will need to make the size of the car and the people inside it get smaller and smaller as the road gets narrower.
Soundtrack design

With all animation techniques, the soundtrack is created separately and then added in after the animation has been created. If you are using a simple soundtrack, for example a single song, indicate on your storyboard where it should start and where it should stop. Also decide whether it fades in and out or stops and starts abruptly at either end.

For more complex soundtracks, involving music, speech and sound effects, you could write the details clearly on your storyboard or you could make a storyboard just for the sound. Make sure that each part of the soundtrack doesn’t drown out any other parts. For example, the footsteps sound effect played as the characters are walking down the street shouldn’t cover up more important audio, such as what the characters are saying as they walk.

Point of view

You can tell the story from different points of view. For example, will events be seen through the eyes of one of the characters or will they be seen as if through the eyes of the audience watching the events unfold?

Different effects can be created by moving the point of view. For example, you might want to show the point of view of a child character, which will be low down and as if looking up. You then might want to show the parent’s point of view when they reply to the child, which will be higher up and as if looking down.

Consider using a mixture of close-ups to show details or pans to take in the scope of the environment.

Key term

**Pan** – a term used in filming where the camera moves as it records. This effect can also be created in animation.

Just checking

1. What are the three key things you need to decide about your animation as you start to design it?
2. What is a genre? Give two examples.
3. What are the different elements of an animation you need to design?
4. Why must you consider technical limitations?
5. What methods can you use to create your design on paper?
6. What does fps stand for and what does it mean?
Your manager at Striped Cloud Studios has asked you to create an example animation to show what you are capable of. She wants to find out what you can do, so she can put your skills to best use in their animation team. She has asked you to create an intro sequence for a computer game. You can invent the idea for the game and design it for any audience. Your intro should not contain any interactivity, except perhaps a menu at the end with the choice to replay the intro or start the game.

1. Present an idea for an animation sequence.
   a. Make some initial notes about your thoughts on this project and what you might like to produce. P2 M2 D2
   b. Write a summary of the animation techniques you intend to use and why you have chosen these techniques. P2 M2 D2
   c. Create an ideas board to explore different characters, genres, colour schemes, environments and styles of animation. P2 M2 D2

2. Develop your idea.
   a. Draw a spidergram to explore several different ideas you have at this point for the animation you will make. P2 M2 D2
   b. Decide on the audience for your game and write a summary of how the choice of audience will affect your animation. P2 M2 D2
   c. Create some designs of your characters and environments using a combination of sketches and photographs. P2 M2 D2

3. Show use of original and imaginative ideas in your idea for an animation sequence. D2

Grading tips
- For P2 you need to show that you have taken care when working on your idea and in the presentation of all the separate parts of the design. Make sure that your work is neat, whether you have created it on computer or drawn it by hand.
- This task allows you to be really imaginative, which is part of achieving D2. You also need to show you have taken an active approach to your work by making decisions, inventing your own ideas and working independently. Your design should display your enthusiasm for the task.
3. Be able to create an animation sequence

Once you have created your design, you are ready to start making your animation. There are three stages to this: pre-production, production and post-production.

Activity: Caterpillar to butterfly

Using the technique you chose in the last section, create a quick and simple animation of the following:

A caterpillar crawls along a branch. It hangs down from the branch and turns into a cocoon. The cocoon gets bigger. Then it changes into a butterfly which flies away.

Make the animation quite rough and feel free to be experimental. Use this to practise your skills and begin to find your own style of animation.

Save this animation as you will need it later.

3.1 Pre-production

Pre-production is where you prepare all of the resources which you are going to use. If you are using traditional techniques, this could mean making models, creating sets, preparing film rolls or recording sound effects. For digital animation, you need to create your assets, including characters, objects and backgrounds.

If you need to carry out research, either into the animation techniques or the topic which you are making your animation about, this is the time to do it (if you haven’t already done it during the design stage).

In this section you should think about creating scripts, sketches, models, materials, storyboards and sets. You will also need to decide on music and sound effects. Which of these you need to create will depend on the type of animation you have decided to produce.

3.2 Production

Once you have prepared all of your resources, you can move on to actually create your animation. Make sure you follow your storyboard. You may need to make changes as you create the animation. If you do make a change, make sure you note down the change on the storyboard, as it may have a knock-on effect later in your animation.

Key term

Asset – an element of the animation such as a graphic or a sound file.
Work on each scene individually, never losing sight of the whole piece, but focusing on the details. By the end of this phase, all parts of your animation should move where you want them to, although the animation may still be a little rough.

This section may include model making, set building, drafting, working with layout, deciding on point of view, using key frames, copy writing, audio recording and filming. Again, this will depend on the type of animation you have decided to create.

You may find it useful to keep a production log – this is a folder which contains all of your design documentation (with annotations if you make any changes while creating the animation) and a record of your progress. For example, in your production log you could make a note of where you were up to when you finished for the day, so that the next time you begin to work on your animation you know exactly what you have just done and what you need to do next.

### 3.3 Post-production

Post-production is the final stage, in which the animation is edited and polished. You add sound at this stage and synchronise it with the movement. You might include special effects, for example, you can use easing to slow down or speed up a tween, which is good for giving the impression of gravity, or you could put filters on to the film, perhaps to make it look grainy and old. You could also add transitions between scenes, such as a black fade to show the change of location or action.

This is the stage where you look at the animation as a whole and ensure that it is the best it can be. It may involve editing, such as cutting, transitions and changing timing, adding special effects, mixing and editing the sound or synchronising visuals to sound, depending on the type of animation you have chosen to create.

### Using Adobe® Flash®

Flash® is an animation program which allows you to make 2D animations, usually in a cartoon style. The following How to... sections give you instructions for creating three types of animation in Flash®. This should give you the basic building blocks for using the program. You can use these techniques separately or together.
How to... Create a stop frame animation

- Open a new Adobe® Flash® stage (File, New).
- Select the Oval Tool.

**Figure 30.4:** Selecting the Oval Tool.

- Choose any Fill Color and no outline.

**Figure 30.5:** Choosing the Fill Color and Stroke Color.

- Draw a circle. (Hold down the Shift key to make it a perfect circle.)
- Right click and copy the circle, then paste it four times so you have five circles. Arrange these into a pattern or shape.

**Figure 30.6:** Five circles arranged into a pattern.

- On the timeline (at the top of your screen) you will see that frame 1 is already a keyframe. Right click on the next frame and choose Insert Keyframe.

**Figure 30.7:** Inserting a keyframe.

- Repeat this three more times, so you have a total of five keyframes. (Notice how your circles have copied identically on to each new keyframe.)
- On keyframe 1, delete one of your circles. Repeat this on each keyframe, deleting a different circle each time.
- Test your movie by pressing Control and Enter together.
- The circles should flash off and on.

**Key terms**

*Timeline* – the visual line which shows the time of the animation, divided into frames.

*Keyframe* – a moment in the animation where something happens, e.g. the beginning and ending of a tween should both be a keyframe.
How to... Use motion tweening

- Open a new Adobe® Flash® stage (File, New).
- Select the PolyStar Tool and use the Options button at the bottom of the screen to choose a Star.

Figure 30.8: Selecting the PolyStar Tool.

Figure 30.9: Choosing the star option.

- Choose any Fill Color and no outline.
- Draw a star on the stage.
- Using the black arrow tool at the top of your toolbar, place your star in the top left of the stage.
- Right click on the star and select Convert to Symbol.
- Call it ‘star’ and select the type ‘movie clip’. Click OK. (Notice how the star has been saved in your library.)

Figure 30.10: Converting the star to a symbol.

- On the timeline, right click on frame 10 and select Insert Keyframe.
- Make sure the keyframe at 10 is highlighted and move your ‘star’ to the bottom right corner of the stage.
- On the timeline, on the grey section between the two keyframes, right click and select Create Motion Tween.

Figure 30.11: Selecting Create Motion Tween.

- The grey part should turn blue and an arrow should point from the first keyframe to the second one.
- Test your movie by pressing Control and Enter together.
- The ‘star’ should move from one position to the other.

Activity: Motion tweening

To extend the motion tweening you carried out above:

1. use three more keyframes to move the star to the top right corner, then to the bottom left corner, then back to the top left.
2. make the star rotate as it moves. (Hint: click on the tween and select Rotate at the bottom of your screen – you can choose clockwise or counterclockwise.)
How to... Use shape tweening

- Open a new Adobe® Flash® stage (File, New).
- Select the Text tool, draw a textbox onto the stage and enter the text ‘1’.
- Change the ‘1’ to a ‘2’ and make sure it has the same formatting, is in the centre of the stage and is broken apart.

Figure 30.12: The Text tool in Adobe® Flash®.

- Format the ‘1’ so it is in font Arial and size 48pt.
- Use the Align palette (Control + K to open) and centre the ‘1’ to the exact middle of the stage.

Figure 30.13: The Align tool box.

- Highlight the ‘1’ and use Control + B to break apart until the shape is ‘dotty’ (not highlighted with any blue boxes).
- Create a keyframe at frame 20 (right-click then Insert Keyframe).

Figure 30.14: Changing the ‘1’ to a ‘2’ in the 20th keyframe.

- On the timeline, on the grey section between the two keyframes, right-click and select Create Shape Tween.

Figure 30.15: Create a shape tween by clicking the timeline.

- The grey part should turn green and an arrow should point from the first keyframe to the second one. (Note: if the arrow is dotted, the shapes probably need to be broken apart again.)
- Test your movie by pressing Control and Enter together.
- The ‘1’ should morph into a ‘2’.

Activity: Shape tweening

To extend the shape tweening you carried out above:

1. on a new stage, try morphing a green square into a red circle
2. on a new stage, try morphing your first name into your last name
3. to further your knowledge, try looking up motion paths (sometimes called guide layers).
BTEC’s own resources

Just checking

1. What happens at the pre-production stage?
2. What happens during production?
3. What might happen in post-production?
4. What is a production log?

PLTS

• By managing your time and resources to make sure you meet the deadline and make the best product you can, you will show that you are a self-manager.
• If you are working in a group, by collaborating with others to produce an animation and taking responsibility for your own role, you will show that you are a team worker.

Functional skills

• Working out timings for producing and editing your animation could provide evidence of your functional Mathematics skills.
• Producing your animation could provide evidence of your functional ICT skills in developing, presenting and communicating information.

Assessment activity 30.3

Your manager at Striped Cloud Studios likes your designs and has asked you to create your animation.

1. Carry out pre-production tasks, including completing your detailed design, preparing your assets (such as music or sound effects) and preparing your characters and environment. Remember to include any additional designs you create here in your project documentation. P3 M3 D3

2. Create your animation, using your design. As you are doing this, ask your tutor to monitor your work and provide witness statements, especially when you are carrying out a very technical process. P3 M3 D3

3. Carry out post-production tasks, including any final editing, special effects and adding audio. P3 M3 D3

M3: Learners will show ability in the handling of equipment.

Grading tips

• As your design is individual to you, it is your responsibility to make sure you carry out all the relevant tasks for pre-production, production and post-production that relate to your product.
• For M3, you should aim to produce an animation in which the movement of on-screen elements is smooth, the narrative tells a clear story and the point of view is consistent.
• For D3, you should demonstrate that you are in control of the technology you are using and that you can use it effectively and imaginatively. There will be few if any technical problems in your animation.
4. Be able to review your own animation production

When you have finished making your animation, you will need to review it to check that it fulfils its original purpose and also to find out what other people think about it.

Your evaluation will look at various aspects of the product and the process of how you made it. For each aspect you are reviewing, you should describe the good points, the bad points and the things which could be improved. Think about how you might do things differently if you were to do it again. Be self-critical but don’t be afraid to be proud of your work and state the things that went well. Your evaluation should aim to be quite balanced.

**Activity: Caterpillar to butterfly – the review**

- Review your Caterpillar to butterfly animation: list three good points, three weak points and three things you would improve if you were to make it again with more time.
- Swap your animation with someone else in your class and ask them to review your animation in the same way. (Do the same with their animation.) Compare their review of your animation with your own. Did you agree or not? Did you both mention the same things? Why do you think this is?
- Consider how it felt to review your own work. Was it difficult to be critical or to say good things about it? How did it feel to have someone else review your work?
4.1 Evaluating the finished product

Make sure your product is finished and always back up or make a copy of your animation, so the original is safe.

When you are evaluating your animation there are several areas which you need to look at, as described in Table 30.2.

Table 30.2: Points to consider in your review of the animation.

| Compare with original intentions | At the very beginning of your animation project, you should have outlined your intentions. You will have defined:  
• who your audience would be  
• the animation technique you would use  
• the style of the animation.  
In your evaluation, address each of these three areas, giving examples of where your animation matches your aims. For example, if you have made an advert for a website, you could describe how the language is persuasive, the colours are eye-catching and the file size is small so it loads quickly. |
<table>
<thead>
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<tbody>
<tr>
<td>Appropriateness for audience</td>
<td>At the beginning of the project, you should have clearly defined who your audience for the animation would be. In your review, you can explain how the choices you made helped make the animation appropriate for your selected audience. For example, if you decided to make an animation for young children, you could show how your characters, the language you have used and the colour scheme suit this audience.</td>
</tr>
<tr>
<td>Technical qualities</td>
<td>When describing the technical aspects of your animation, discuss the steps you took to actually create the project and evaluate each of these steps. For example, if you have created a digital animation and have used a motion tween, explain how and where you used it and why this was the best method to use. Also, say whether you think it has turned out well and what aspects of the process you could improve.</td>
</tr>
</tbody>
</table>
| Aesthetic qualities | First, look at the animation in its entirety and ask:  
• overall, does the animation look the way it should?  
• are the movements smooth and realistic, creating a high-quality animation?  
Once you have considered the whole animation, discuss the details, such as the characters and the backgrounds. |
| Content | The content might be the message that is being conveyed or the story that is being told. You can review this aspect by asking questions such as:  
• is the story or message conveyed clearly?  
• will the audience understand what the animation is trying to say?  
If you have used speech, is it comprehensible and has it been synchronised well? |
| Style | Refer back to the style and genre you outlined at the beginning of your design and review whether you have satisfied the requirements of these choices in your animation. Remember that each genre comes with a set of ‘rules’ which need to be fulfilled, such as using dark colours for horror. Ask yourself:  
• is the animation recognisable as being the genre that you selected?  
• are the elements of the style consistent throughout the animation? |
4.2 Evaluating the production process

As well as evaluating the final product, you should also examine the process through which you travelled in order to produce the final piece. You will need to examine each of the stages described in Table 30.3.

Table 30.3: Stages in the animation development process.

| Design documentation | In this part of the evaluation, look at the design documents that you produced. Ask questions such as:  
|  | • were the design documents detailed enough?  
|  | • were you able to just follow them or did you need to keep adding details of the product as you were actually making it? |
| Pre-production | Evaluate the preparation you did for the project, including any research you carried out. Ask questions such as:  
|  | • were the characters and backgrounds you made in the pre-production stage useful in the production stage or did you need to alter them once you had started working with them?  
|  | • did you find it useful to prepare all of your assets and resources before starting to animate? |
| Production | To evaluate the production stage, you will need to ask questions such as the ones below.  
|  | • When creating the animation, did you manage your time effectively and meet all deadlines which were set?  
|  | • Did you manage the project well and carry out tasks in a logical order? Or did you find that this stage was quite chaotic?  
|  | • How did you carry out the technical aspects of the project? Did you use the equipment and/or software competently?  
|  | • Did you develop new skills? If so, did this happen in a structured way or was it haphazard (you developed them as you discovered you needed them)?  
|  | • How did you use your creativity throughout the project?  
|  | • Did you use your design documentation, including notes, sketches and storyboards, when creating your animation? If so, how did you use them and were they helpful?  
|  | • If you were working in a team, how well did you manage your own work within the team? How well did you work as part of the team to contribute to the whole project? |
| Post-production | To review the post-production stage, ask yourself questions such as:  
|  | • did you manage your time effectively during the final stages of the project or did you find yourself rushing towards the end?  
|  | • how did you use your technical abilities and creativity at this point in the project?  
|  | • did you work on your own or in a team?  
|  | • how did you find this experience and what would you change if you were to do it again? |
4.3 Evaluating using your own and other people’s opinions

When you are reviewing and evaluating your work, you should try to include both your own opinion and the opinions of other people. You should evaluate it yourself because you know the product best and can evaluate it in detail. However, it is very useful to get the opinions of other people, as they can provide you with a different perspective.

Obtaining other people’s opinions

There are three different ways to obtain feedback from other people:

- **Observation** – an audience watches your animation and you observe them, for example to see if they laugh or jump in shock when you expect them to.

- **Interviews** – although it is time-consuming to carry out interviews, it can give you very detailed and useful feedback. Try speaking to people who have seen the animation one or two at a time.

- **Questionnaire** – ask a group of people to watch the animation and then fill in a questionnaire about it. This is a great way of obtaining many people’s opinions quickly, but make sure you word the questions carefully so they are very clear and will provide you with the information you need to be able to review your animation.

For more help on writing questionnaires, see *Unit 28 Multimedia design*, page 32.

The people you may wish to review your animation for this project include other learners in your class, learners in other classes and who are studying other subjects, tutors, friends and family. Think about the target audience for the animation and try to get feedback from people in that category.
Just checking

1. Why is evaluation important?
2. What are the different areas you can analyse during an evaluation?
3. What is the difference between evaluating the final product and evaluating the process?
4. How can you obtain other people’s opinions of your work?

Assessment activity 30.4

Now that you have completed your animation, your manager has asked you to finish the project by carrying out a review of your work. You will need to present your animation to an audience and obtain feedback as part of this process.

1. Review the strengths and weaknesses of your final animation and the process you went through to produce the animation. Create a two column table which contains brief notes of strengths on one side and weaknesses on the other. P4
2. Extend this table to describe in detail the strengths and weaknesses of your production work using suitable examples of each, taken from your work, in your description. M4
3. Finally write up this information in the form of an evaluation which includes detailed descriptions and examples of strengths and weaknesses, details of why they are strengths and weaknesses, and what could be done to eliminate or minimise the weaknesses you have found. D4

Grading tips
- Try to choose a different format for your review from the one you used for your report in Assessment activity 30.1.
- For M4 you should provide examples from your work for each point you make.
- For D4 you need to make sure that the examples you give are precise, well-described and directly linked to the point you are illustrating.

PLTS

By evaluating the process you have gone through and reviewing your product, you will show that you are a reflective learner.

Functional skills

Presenting your animation and obtaining feedback from the audience could provide evidence of your functional English skills in speaking and listening.
I work at an animation studio which specialises in CGI for television programmes and movies. I work in a small team and I find the work very rewarding.

**How did you get this job?**
I’d always been interested in computers and mostly the visual side. I used to play around with Flash® and make small 2D animations in my free time when I was at college. I chose to study a degree in multimedia and it was there that I really developed my skills in animation. In my final year at uni, I put together a portfolio of all the work I’d done for my coursework, in my spare time and for work experience. I then submitted that portfolio to some animation studios – the studio I work for now were interested and offered me a job.

**Describe your work**
It’s really interesting. One project might be huge, like multiplying people in a stadium to make it look full, then another project might be tiny and detailed, such as showing how a part of the body works. Each project is new and challenging. I work with a brilliant team of people, which is good when we have big projects where we have to split the work between us. When this happens, the team needs to ensure excellent communication as the whole animation has to run smoothly and it shouldn’t be visible that several different people have worked on it.

My job does have its frustrating parts. Deadlines can often be quite tight and clients can sometimes change their minds, which can be annoying, although usually it results in a better animation in the end.

You have to be very good at working with detail because if the small things are right, then the whole animation will look great.

**Think about it!**

- What technical skills do you think you need to be an animator? Are you developing these skills in this unit?
- What personal skills, such as communication, do you think are important in this type of role?
Just checking

1. Name some of the early devices used to watch animations.
2. Describe the key works of six influential animators and the techniques they used.
3. Give six examples of contemporary uses of animation.
4. What types of documentation can you use to help you design an animation?
5. What elements of the animation need to be considered at the design stage?
6. Name the three stages of creating an animation and list what should be done during each stage.
7. Why is it important to evaluate your finished animation?
8. How can you obtain reviews of your animation from other people?

Assignment tips

• Watch as many animations as you can, as this will help you to identify the different ways they are used and give you more options when you make your own animation. Try to view many different types of animation technique and animations which have been created for different purposes.

• When designing your animations, be ambitious but also be realistic. You will have a certain amount of time in which to create your animation and you must make sure you meet your deadline. In the business world, an animator may create the most stunning animation ever seen, but if it is not done on time then the client will not pay.

• At all stages, remember who your audience are, as they are the ones you will want to watch your animation. Make sure it is not only appropriate but something they may choose to watch (such as an animated short on the Internet) or will stop what they are doing to watch (for example an advert).