Unit 36: Computer Game Platforms and Technologies

Unit code: L/600/6610

QCF Level 3:   BTEC National

Credit value: 10

Guided learning hours: 60

● Aim and purpose

The aim of this unit is to develop learners' understanding of computer game hardware and software technologies, to teach them how to assemble and connect a combination of these components into playable systems, and to stress the importance of keeping up to date with the latest developments in game software and hardware.

● Unit introduction

Computer game development is a collaborative process involving multi-disciplinary teams. Game designers should have a full understanding of the capabilities and benefits of the different hardware platforms (such as PCs, consoles and mobile devices) as well as familiarity with software technologies and techniques appropriate to each platform. Sound knowledge of contemporary game hardware platforms, as well as the latest software technology, is highly desirable when seeking a career in this industry.

Game designers must be able to communicate their vision to artists, programmers, producers, marketing staff, and others involved in the development process, be able to offer constructive criticism on the work of others and accept feedback on their own work. Each person entering this industry needs to have a basic awareness of the systems used to support gameplay, and have some grasp of how today's sophisticated interactive games have been enabled by hardware and software developments. In this way a common agreed language can be established for the interchange of the technical and marketing considerations of every game design.

For any job in the industry, good technical knowledge is required, with awareness of the various game platforms and technologies. In order to communicate effectively with others, it is necessary to understand the technical language used to describe elements of game systems, and be able to recognise the limitations inherent in the destination platform selected for any game. To avoid making impossible demands of the specified platform, those working in the industry must be aware of the function and purpose of each component of the modern interactive game system.

Game systems are dedicated computers, requiring software instructions to organise their processing. Different platforms have particular programming requirements. In this unit learners will have opportunities to examine the features and limitations of the basic software employed in typical game platforms.

The games industry is constantly evolving, both creatively and technologically, and it is important that learners keep up to date with the latest developments. This unit encourages not only the study of hardware and software technologies, but also the combination of these components into playable systems for use by single players and interactively among teams.

Learning outcomes

On completion of this unit a learner should:

1   Understand game platform types

2   Understand hardware technologies for game platforms

3   Understand software technologies for game platforms

4   Be able to connect and configure platforms and devices to enable gameplay.

Unit content

1   Understand game platform types

Development history: timeline; enabling technical developments

Arcade: features, eg coin operated, PC emulation, vector-based, laser disc-based; limitations

Consoles: features, eg Playstation, Xbox, PSP, DS, Wii, Switch; limitations

PC: features, eg offline, online; limitations

Mobile: features, eg handheld, PDA (personal data assistants), phone, tablet, GSM, 3gpp; limitations

Television: features, eg interactive, online, public service broadcast, cable, satellite, MHP; limitations

2   Understand hardware technologies for game platforms

Human-computer interface: interface devices; ergonomic design; button configurations; user-centred design; portability

Central processor unit (CPU): types; speed; cache; address/data bus

Graphic processor: types; speed; cache; address/data bus; two-dimensional (2D) and three-dimensional (3D) processor, eg pixels, polygons, nurbs; speed; graphics memory

Memory: purpose; random access memory (RAM); capacity; type, eg rambus dynamic (RDRAM), static (SRAM), dynamic (DRAM), unified

Display: built-in; external; liquid crystal (LC); colour; monochrome

Sound: sound cards; audio processor; mono; stereo; 3D; surround; channels; sampling rate; memory; media communications processor (MCP)

Game storage medium: proprietary; standard; flash memory; digital versatile disc (DVD); optical disc; universal media disc (UMD); magnetic tape; internal; speed; size; advantages and disadvantages; anti-piracy

Interface devices: game devices, eg paddle, joystick, keyboard, joypad, mouse, wheel, pedals, eye toy; ports; wireless; cabled; analogue; digital; controller ports

Connectivity: stand alone; controller ports; local area network (LAN); wide area network (WAN); internet; broadband; wireless general packet radio service (GPRS); wireless application protocol (WAP); wifi; Bluetooth®

Power supply: internal battery; external source

3 Understand software technologies for game platforms

Platform dependency: dependent; independent

Operating systems: for PC/Macintosh, eg Windows, Linux, Mac OS; for hand held, eg Windows CE, Palm OS; for mobile, eg Symbian OS (Nokia N-Gage), BREW, Mophun

Drivers: soundcard driver; graphics card driver; network interface controller (NIC)

Application software: interpreted languages for games (Java, J2ME, C#); compiled languages for games (C++); object-oriented (C++, C#, Java, J2SE, J2ME); scripting, eg Lingo, UnrealScript, QuakeC, Maya Embedded Language, ActionScript, JavaScript

Graphical API: OpenGL; OpenGL ES; DirectX

Sound API: OpenAL; Java Sound API

Television: conditional access; iTV; ETV

4 Be able to connect and configure platforms and devices to enable gameplay

Connect and configure: console to display; console to console; local area network (LAN), eg peer to peer, server based; wide area network (WAN), eg Xbox live, MS Arcade, online multiplayer; wireless; cabled devices to platforms, eg keyboard, mouse, paddle, joystick, wheel, pedals, eye toy; wireless devices to platforms, eg joystick, keyboard, mouse, controller, wheel; PC device drivers (graphics card, sound card, network interface controller)

Install and configure games: install PC and console games; configure PC and console games

Evidence building: eg learning log, blogs, wikis, authenticated checklist, photographs, video, portfolio

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 describe game platform types with some appropriate use of subject terminology	**M1** explain game platform types with reference to detailed illustrative examples and with generally correct use of subject terminology	**D1** comprehensively explain game platform types with elucidated examples and consistently using subject terminology correctly
P2 describe hardware technologies for game platforms with some appropriate use of subject terminology	**M2** explain hardware technologies for game platforms with reference to detailed illustrative examples and with generally correct use of subject terminology	**D2** comprehensively explain hardware technologies for game platforms with elucidated examples and consistently using subject terminology correctly
P3 describe software technologies for game platforms with some appropriate use of subject terminology	**M3** explain software technologies for game platforms with reference to detailed illustrative examples and with generally correct use of subject terminology	**D3** comprehensively explain software technologies for game platforms with elucidated examples and consistently using subject terminology correctly
P4 apply techniques to connect and configure platforms and devices with some assistance. [SM]	**M4** apply techniques to connect and configure platforms and devices competently with only occasional assistance.	**D4** apply techniques to connect and configure platforms and devices to a technical quality that reflects near-professional standards, working independently to professional expectations.

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Since this unit underpins the knowledge requirements of all other games-related units, it is recommended that it is covered early in the programme. The unit gives learners an insight into the underlying technologies that enable games to be hosted and played on a variety of platforms. Successful teaching of this unit requires a blend of tutor-led lecture and individual learner research and reading. Practical sessions will involve learners in connecting peripherals to platforms, and platforms to networks to enable gameplay. Centres are advised to ensure they have a wide range of platforms, peripherals and networks to facilitate these practical exercises.

It is suggested that teaching follows the logical pattern presented in the learning outcomes, with initial study of the historical development of game platforms reflecting advances in technology. This overview of game platforms will lead naturally to deeper study of the enabling technologies, and an appreciation of the operating systems and development software controlling platform actions. Every opportunity should be sought to relate tutor-led learning and private research to practical experience with game systems. Learners should compare written specifications with performance in gameplay. Practical gameplay is an essential aspect of this unit as it demonstrates the capabilities and performance of each platform. However, such play must not outweigh other methods of learning. When playing games, learners must understand the specific reason for such play. Practical activities to complement lectures could involve the preparation of timelines and deeper case studies of individual platform types.

Learners' personal investigations of each aspect of the enabling technologies could be undertaken following lectures where core concepts have been established and their importance clarified. Since this is a largely knowledge-based unit, every opportunity should be taken to relate theory from lecture and research to practical experience in order to stimulate learners and maintain interest. For example, when teaching theory on peripherals, it would be appropriate to follow the lecture immediately with a practical session where the named peripherals are examined, held, connected and played.

Study of operating systems and software development tools will largely be through tutor-led classes, since to operate such tools requires some knowledge of programming skills not expected for this unit. Learners could compare the software specifications of a variety of platforms and compare their performance in actual gameplay, evaluating observed differences caused by software variations.

Learners are expected to cable peripherals to platforms, and interconnect platforms to form playable networks. Typically teaching will be by demonstration followed by practical sessions where learners themselves connect the devices. Learners should record their experience only where they have done this work independently.

There are opportunities to include visiting speakers and visits to conferences and exhibitions to maintain knowledge of current developments. Subscriptions to professional game development journals will enable learners to become aware of trends in technology development.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way of planning the teaching and assessment of this unit.

Topics and suggested assignments and activities
Introduction to unit and unit assessment.
Introduction to game platform types. Learners will receive lectures and demonstrations, and hold discussions to: • examine the development history of game platforms • explain arcade, console, PC, mobile and television game platforms.
Assignment 1 – Interactive Game Platforms Brief is to write an article for an online game ezine on the types of interactive game platforms, highlighting their limitations. Learners will: • investigate the development history of game platforms • investigate the features and limitations of arcade and console game platforms • investigate the features and limitations of PC, mobile and TV game platforms • generate an article for online game ezine.
Introduction to game platform hardware technologies. Learners will receive lectures and hold discussions to explain the hardware technologies associated with game platforms.
Assignment 2 – Current Hardware Technologies Brief is to write an article for an online game ezine on the hardware technologies available within the current games market. Learners will: • investigate HCI developments for game platforms • investigate both central and graphical processors for game platforms • investigate memory, display and sound technologies for game platforms • investigate game storage medium, interface devices, connectivity and power supplies for game platforms • generate an article for online game ezine.
Introduction to game platform software technologies. Learners will receive lectures and hold discussions to explain the software technologies associated with game platforms.

Topics and suggested assignments and activities
Assignment 3 – Current Software Technologies Brief is to write an article for an online game ezine on the software technologies available within the current games market. Learners will: • investigate platform dependency of game platforms • investigate operating systems used for game platforms • investigate drivers for sound, graphics and network interface cards for game platforms • investigate application software used to develop games • investigate graphical and sound APIs used for game platforms • investigate software technologies used for games on television • generate an article for online game ezine.
Introduction to connecting and configuring game platforms and devices to enable games to be played. Learners will receive lectures, demonstrations and hold discussions on how game platforms and their associated devices are connected and configured. Learners will: • connect and configure a range of game consoles to enable games to be played by peers • connect and configure a range of game devices to game consoles to enable games to be played by peers • connect and configure PCs to enable games to be played by peers • connect and configure a range of game devices to PCs to enable games to be played by peers • install a range of games onto various game platforms and configure them to enable the games to be played by peers • install and configure graphics and sound card drivers to enable games to be played on a PC by peers • install and configure LAN and WAN-based PC games to enable multiplayer games to be played by peers • install and configure LAN and WAN-based console games to enable multiplayer games to be played by peers.
Assignment 4 – Connection and Installation Learners will create a portfolio of evidence demonstrating how they have connected and configured platforms and devices, and installed games.
Unit learning and assessment review.

Assessment

Evidence for assessment

Evidence for achievement of learning outcomes 1, 2 and 3 of this unit is likely to comprise presentations and reports describing game platform types and explaining hardware and software technologies. Innovative scenarios could be selected as means to give realistic context to the evidence. For example, learners might be required to prepare an extended electronic presentation as content for a game review slot within a children's television programme. For learning outcomes 2 and 3 a report, journal article, poster presentation or electronic presentation, with research log, could provide suitable evidence. Learners could also prepare wiki articles or blogs covering the unit content.

Oral presentations must be recorded for internal and external verification purposes.

Comprehensive, authenticated logs supported by other materials describing content and purpose may be suitable vehicles to evidence the connection of platforms and peripherals for learning outcome 4. Evidence for connectivity should be built up over a period of study, though there are opportunities to use alternative evidence building tasks. For example, learners could take responsibility to regularly prepare a room for a Games Club for a local school, or set up a 'LAN party' for their peers, loading games and cabling platforms and interface devices.

For some elements of this unit, and for some learners, a formal viva voce assessment might be appropriate. When more than one learner in a cohort is assessed in this way care must be taken to ensure that all learners are asked equivalent questions, and that all are given equal opportunities to expand or clarify their answers. Interviewers must also ensure that questions are not phrased in such a way as to provide or suggest an answer. Formal vivas should be recorded for the purposes of internal and external verified.

Application of grading criteria

When applying the grading criteria tutors should follow the advice given below. Please note that any examples of evidence given here are indicative only. This advice is not inclusive and the examples need not be included in a learner's work in order for that learner to achieve the exemplified grade.

Pass

To achieve a pass grade, learners must achieve all the criteria at pass level. For each of the criteria learners must present evidence that addresses each italicised sub-heading of the content for the learning outcome.

P1: learners will offer basic though substantially complete and correct descriptions of platforms. There must be some mention of limitations, though for this grade this will be an obvious, generic statement of fact. A learner discussing arcade platforms might note, 'An arcade game is housed in a painted wooden cabinet. It has a system for collecting money to pay for the game. Arcade games are often seen in pubs.'

P2: in describing hardware technologies learners will offer accurate but broad and limited descriptions of the basic and most obvious features. A learner might note, 'The joystick is a widely recognised game peripheral. Joysticks give analogue output by rotating potentiometers. Analogue signals must be converted to digital for use by the game platform.'

P3: learners will offer basic though substantially complete and correct descriptions of operating systems. For this grade these will be broad and limited descriptions of the basic and most obvious features. When describing sound card drivers, a learner might note, 'To use a sound card, the operating system needs driver software specially written for the card. The card driver takes instructions for sounds from the game program and outputs them in a form the sound device can use.'

P1, P2, and P3: evidence will show a basic understanding of technical terminology but learners will generally be unsure about this vocabulary and will make fairly frequent mistakes when they do use it.

P4: learners will provide evidence that they have connected and configured the full range of platforms and devices and installed games as specified in the unit content. Where learners keep personal records of this work, these must be supported by other evidence, for example by having others use the connected system and countersign the record to certify successful connectivity. Learners may have required additional assistance from tutors to prepare their evidence or perform their tasks. If they have been in frequent need of such help but fail to make use of it they should not be considered for a pass grade.

Merit

To achieve a merit grade, learners must achieve all the pass and all the merit grade criteria. For each of the criteria learners must present evidence that addresses each italicised sub-heading of the content for the learning outcome.

M1: learners will use examples to relate their descriptions of platforms to technology development revealing an understanding of the limitations of the various platforms. A learner might note, for example, 'An arcade game is housed in a wooden cabinet painted to attract the player and advertise the game style and theme. Arcade games are often coin-operated and are popular money earning devices in pubs and entertainment locations. In addition to artwork on the cabinet, the screen, known as a bezel, often has silk-screened artwork done in the theme and visual style of the game (as can be seen in my photograph of the bezel of *Game Y*).'

M2: learners will give correct descriptions of hardware technologies which are enhanced with appropriate examples. A learner might note, 'The joystick is a widely recognised game peripheral. Figure *x* is an image of an analogue joystick for *Platform A*. Analogue joysticks have potentiometers for up, down, left and right. When the joystick is moved in any of the directions, a varying current for that direction is sent to the game platform. The output from the circuit is analogue which must be converted to digital for use by the game platform. This conversion is performed by an additional circuit within the joystick base.'

M3: learners will enhance descriptions through the use of appropriate examples which reveal good understanding. A learner might note, for example, 'To use a sound card, the operating system needs driver software specially written for the card. The card driver takes instructions for sounds from the game program and outputs them in a form the sound device can use. Driver software is specially written for the target computer system, it is 'hardware dependent' and also operating system specific, meaning the driver works only with one processor and operating system combination. The Sound Blaster series of sound cards each had unique driver software but recently the makers have updated the driver software for all cards in the series to improve performance.'

M1, M2 and M3: learners will use technical vocabulary for the most part correctly, but may make mistakes or be unsure about usages at times

M4: learners will produce evidence that they have connected and configured the full range of platforms and devices and installed games as specified in the unit content. Where learners keep personal records of this work, these must be supported by other evidence, for example by having others use the connected system and countersign the record to certify successful connectivity. Their evidence, consisting of personal logs, blogs, wikis or other means, will be complete, and reveal a systematic thoughtful attention to gathering the necessary evidence. Evidence will include discussion of problems and how these have been successfully resolved. Application of methods will have been correct and will have required only limited additional assistance. Evidence might be provided in the form of a log supported by screen dump or video or audio capture.

Distinction

To achieve a distinction grade, learners must achieve all the pass, all the merit and all the distinction grade criteria. For each of the criteria learners must present evidence that addresses each italicised sub-heading of the content for the learning outcome.

D1: learners will evidence confidence and mastery of knowledge of game platform types, correctly relating platform development to technology developments. They will make accurate comments on features and limitations using extended examples which are fully clarified to show how they carry the point being made. For this grade, explanations will be free from confusion or ambiguity, drawing out of the examples precisely those aspects that exemplify the point under discussion. A learner might note, for example, 'An arcade game is housed in a wooden cabinet painted to attract the player and advertise the game style and theme. Arcade games are often coin-operated and are popular money earning devices in pubs and entertainment locations though many individuals now build personal free-play versions of their favourite arcade games based on PC platforms using emulators such as Mame. In addition to artwork on the cabinet, the screen, known as a bezel, often has silk-screened artwork in the game visual style as can be seen in fig *x*, my photograph of *Game Y* in a local hotel. Arcade games entice paying customers by running in 'Attract Mode' when not being played. This may have the advantage of enticing people to play the game but it has the problem that it can cause screen burn which leaves a permanent mark inside the screen, and eventually spoils gameplay. Figure *z* is my photograph showing the screen burn present in *Game Y*.'

D2: learners will evidence confident understanding of hardware technologies by offering correct, detailed discussion using well-selected examples. When describing interface devices a learner might note, 'Figure *x* is an image of an analogue joystick for *Platform A*. Analogue joysticks have potentiometers for up, down, left and right. When the joystick is moved in any of the directions, a varying current for that direction is sent to the game platform. The output from the circuit is analogue-varying values, which must be converted to digital for use by the game platform. This conversion is performed by an additional circuit within the joystick base. For economy a simple circuit is used and so this analogue to digital converter is not very precise. The lack of precision means the processor must pull the joystick regularly to identify movement. This wastes processing time which could be better used in managing gameplay.'

D3: learners will produce an accurate, detailed discussion which evaluates (that is, makes comparisons, or draws out the advantages and disadvantages of) the software they are discussing. They will draw upon well-selected examples and make fluent use of subject terminology. For example, a learner might note, 'To use a sound card, the operating system needs driver software specially written for the card. The card driver takes instructions for sounds from the game program and outputs them in a form the sound device can use. Driver software is specially written for the target computer system; it is 'hardware dependent' and also operating system specific, meaning the driver works only with one processor and operating system combination. The driver software enables the operating system or game program to interact transparently with the hardware device, providing the necessary interrupt handling to permit the interfacing of the hardware components. The Sound Blaster series of sound cards is popular with PC gamers. Each card in the series had unique driver software but recently the makers have updated the driver software for all cards in the series to improve performance, especially the EAX (environmental audio extensions) hardware acceleration for games. EAX are digital signalling presets used to create better ambience within games by more accurately simulating a real-world audio environment.'

D1, D2, and D3: technical vocabulary will be secure and used correctly and confidently at all times.

D4: learners will provide evidence that they have connected and configured the full range of platforms, devices and installed games as specified in the unit content. Evidence might be provided in the form of a log supported by a screen dump, or video or audio capture. Where learners keep personal records of this work, these must be supported by other evidence, for example by having others use the connected system and countersign the record to certify successful connectivity. The documentary evidence will be a comprehensive, fluent and detailed account of all activities involved in the connection of the platforms and devices. The account will evidence competent management of time and resources with efficiently prepared comprehensive and detailed logs supported by extensive and authoritative alternative forms of evidence. Learners will have created evidence autonomously, possibly using a personal blog or wiki, independently seeking opportunities to create effective evidence and collating this evidence without constant support or supervision.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Pearson assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	Assignment 1 – Interactive Game Platforms	Article on the types of interactive game platforms for an online game ezine.	• Collated research data. • Research log. • Ezine article.
P2, M2, D2	Assignment 2 – Current Hardware Technologies	Article on the hardware technologies available within the current games market for an online game ezine.	• Collated research data. • Research log. • Ezine article.
P3, M3, D3	Assignment 3 – Current Software Technologies	Article on the software technologies available within the current games market for an online game ezine.	• Collated research data. • Research log. • Ezine article.
P4, M4, D4	Assignment 4 – Connection and Installation	Working as an IT technician in a games company, the learner is required to connect, configure and install game consoles, devices and games.	Portfolio containing records of: • connected and configured platforms • connected and configured devices • installed and configured games.

Essential resources

Learners will need access to a wide variety of modern and archive game platforms, peripheral devices both cabled and wireless. Learners will require access to a wide variety computer game titles on a range a platforms. Access to a LAN and a WAN is necessary to enable learners to install LAN games and online games. Access to the internet will be required for research and to connect consoles to the worldwide web. Learners will require access to computers to enable them to install games and drivers for graphics cards, sound cards and game peripheral devices. Opportunities for structured gameplay will be required.

Employer engagement and vocational contexts

Centres should develop links with local interactive media production studios which could be approached to provide visiting speakers, study visits or samples of typical products.

Skillset, the Sector Skills Council for the creative media sector, has a substantial section of its website dedicated to careers, including job descriptions

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are …
Self-managers	organising time and resources, prioritising actions, and dealing with competing pressures when producing ezine articles and portfolio of own connectivity and configuration of game platforms.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are …
Independent enquirers	planning and carrying out research into game platforms analysing and evaluate information, judging its relevance and value when researching game platforms.

Functional Skills – Level 2

Skill	When learners are …
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using systems to author their report documents and prepare their dairy/logs and setting up game consoles
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	using systems to author their report documents and prepare their dairy/logs and setting up game consoles
Manage information storage to enable efficient retrieval	managing files created for their report documents and dairy/logs
Follow and understand the need for safety and security practices	using systems to author their report documents and prepare their dairy/logs and setting up game consoles
Troubleshoot	using systems to author their report documents and prepare their dairy/logs and setting up game consoles
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	researching game platform types and hardware and software technologies
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	researching game platform types and hardware and software technologies
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	authoring their report documents showing their findings and understanding of game platform types, hardware and software technologies
Bring together information to suit content and purpose	
Present information in ways that are fit for purpose and audience	
Evaluate the selection and use of ICT tools and facilities used to present information	preparing reports on game platform types, hardware and software technologies

Skill	When learners are …
English	
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	studying research on game platform types, hardware and software technologies
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	creating their report on game platform types, hardware and software technologies.