

Cambridge **TECHNICALS LEVEL 3**

IT

Cambridge
TECHNICALS
2016

Unit 9

Product development

A/507/5010

Guided learning hours: 60

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Guided learning hours: 60

Essential resources required for this unit: none

This unit is internally assessed and externally moderated by OCR.

UNIT AIM

The purpose of this unit is to prepare you to undertake product development activities. You will learn about different product design methodologies and the role of the product development life cycle. In addition, you will discover the factors that influence product developments.

The key to any product development being a success is the analysis, client review, design, testing and final acceptance that takes place. The skills that you will learn can be applied to the development of any product, large or small. You will use product development skills and work through the product development life cycle.

Whether you are building a network, developing a website, developing a system for data analytics or creating an augmented or virtual reality resource, they are all products. It is therefore important that you understand the processes required for the development of products and that you can apply them to a variety of situations.

It is recommended that you develop a product alongside the other units you are studying so that you can explore the units holistically as a wider project. If this unit is being taken as part of a specialist pathway, the product developed could align to your chosen pathway and support progression into your chosen field within the IT industry.

TEACHING CONTENT

The teaching content in every unit states what has to be taught to ensure that learners are able to access the highest grades.

Anything which follows an i.e. details what must be taught as part of that area of content. Anything which follows an e.g. is illustrative, it should be noted that where e.g. is used, learners must know and be able to apply relevant examples in their work, although these do not need to be the same ones specified in the unit content.

For internally assessed units you need to ensure that any assignments you create, or any modifications you make to an assignment, do not expect the learner to do more than they have been taught, but must enable them to access the full range of grades as described in the grading criteria.

Learning outcomes	Teaching content
The Learner will:	Learners must be taught:
1. Understand the product development life cycle	1.1 Product development methodologies (e.g. Waterfall, Incremental, Spiral, Agile development) 1.2 Phases of the product development life cycle, i.e.: <ul style="list-style-type: none"> • requirements analysis • design • implementation • testing (e.g. unit, integration, product, acceptance) • deployment • maintenance 1.3 Constraints, i.e.: <ul style="list-style-type: none"> • time • financial • social (e.g. language, text types) • regulation (e.g. company codes of practice, governmental regulation, national and international law) • standards organisations (e.g. ISO, EN, BS, IEEE) • standards (e.g. safety, design, quality management, risk analysis, reliability, requirements analysis) • the need for compromise (e.g. cost/benefit trade-off, complexity/error trade-off,)

Learning outcomes	Teaching content
The Learner will:	Learners must be taught:
2. Be able to design products that meet identified client requirements	<p>2.1 Requirements analysis phase, i.e.:</p> <ul style="list-style-type: none"> • market analysis (e.g. client needs and wants, end user needs and wants, competing products on the market) • limitations (e.g. target platform, bandwidth, development resources, human resources, etc.) • prototyping • product requirements specification: <ul style="list-style-type: none"> ○ introduction ○ purpose (e.g. what it needs to do, where it needs to be used) ○ context (e.g. stand-alone product or part of a larger whole, a replacement for an existing product, a totally new product) ○ assumptions (e.g. hardware or software to be used, user experience or training) ○ constraints (e.g. timescale, interoperability with existing products, design tools to be used) <p style="text-align: center;"><u>Functional Requirements</u></p> <ul style="list-style-type: none"> • main functional requirements – a set of clearly defined, unambiguous needs of the product, with priorities • target user profiles (e.g. end user tasks, end user knowledge and level of experience, client goals) <p style="text-align: center;"><u>Non-functional Requirements</u></p> <ul style="list-style-type: none"> • usability (e.g. easy to learn, clear operating procedures, appropriate for the level of knowledge of each target user profile) • performance – stated in an easily measurable form (e.g. capacity, availability, response times, environmental issues) • safety (e.g. to prevent possible loss, damage or harm, specific safety standards to be adhered to) • security (e.g. standards compliance, privacy issues, certification) • maintainability (e.g. define consumables, regular calibration activities, updates, bug fixes, error recovery) • interfaces (e.g. hardware, software, communications, user) • appendices (e.g. glossary of terms, diagrams describing processing, a numbered list of TBD (to be determined) items with clear responsibilities and timescales defined)

Learning outcomes	Teaching content
The Learner will:	Learners must be taught:
	<p>2.2 Design phase, i.e.:</p> <ul style="list-style-type: none"> • outline solutions: <ul style="list-style-type: none"> ○ hardware and software ○ functional details (e.g. inputs, processing, outputs, user interface workflow) ○ non-functional details (e.g. usability, performance, safety, security, maintainability and interfaces) ○ prototyping • Presentation of outline solutions to the client: <ul style="list-style-type: none"> ○ meeting (actual or virtual) between client and product developer ○ presentation of outline solutions in an appropriate format ○ review of outline solutions by the client ○ agreement on design specification to be implemented: <ul style="list-style-type: none"> ▪ minor modifications and correcting errors ▪ choice of best features and functionality from the outline solutions ▪ extended features and functionality requested by client ▪ extended features and functionality suggested ○ record decisions made, follow up actions and deadline dates • final design solution (e.g. after obtaining agreement from client), i.e.: <ul style="list-style-type: none"> ○ implementation plan, including deadline dates ○ hardware and software ○ functional details ○ non-functional details ○ additional resources ○ design documentation ○ proposed acceptance test plan
3. Be able to implement and test products	<p>3.1 Implementation, i.e.:</p> <ul style="list-style-type: none"> • creation of product • unit testing (e.g. on-going testing of each separate function/process of the system) • integration testing (e.g. testing that the units work together as expected) • use results of unit testing and integration testing to improve and enhance product during implementation • implementation log • revisit the implementation plan

Learning outcomes	Teaching content
The Learner will:	Learners must be taught:
4. Be able to carry out acceptance testing with clients	<p>4.1 Acceptance testing with target users, i.e.:</p> <ul style="list-style-type: none"> • acceptance testing against the agreed design specification: <ul style="list-style-type: none"> ○ acceptance test plan created (e.g. based on proposed acceptance test plan from the agreed design specification): <ul style="list-style-type: none"> ▪ functional tests (e.g. complete and correct operation) ▪ non-functional tests (e.g. usability, performance, reliability, maintainability, safety, security) ○ acceptance testing with target users (e.g. based on the user profiles listed in the agreed design specification) ○ deployment decision by client (e.g. acceptance, non-acceptance or acceptance after modifications and retest) <p>4.2 Maintenance phase, i.e.:</p> <ul style="list-style-type: none"> • routine maintenance • enhancements to product features and functions (e.g. bug fixes, minor alterations to input ranges or processing carried out on inputs, minor changes to target user requirements) • product upgrades (e.g. due to major changes to target user requirements, additional functionality needed)

GRADING CRITERIA

LO	Pass	Merit	Distinction
	The assessment criteria are the Pass requirements for this unit.	To achieve a Merit the evidence must show that, in addition to the pass criteria, the candidate is able to:	To achieve a Distinction the evidence must show that, in addition to the pass and merit criteria, the candidate is able to:
1. Understand the product development life cycle	P1: Outline the phases of the product development life cycle	M1: Compare and contrast different product development methodologies	D1: Assess the potential impact of constraints upon product development
2. Be able to design products that meet identified client requirements	P2*: Develop a product requirements specification to meet an identified client's requirements <i>(*Synoptic assessment from Unit 1 Fundamentals of IT, Unit 2 Global information and Unit 3 Cyber security)</i>		
	P3: Present an outline of the design solutions to the identified client and obtain feedback	M2: Agree the inclusion of features that extend or enhance the functionality of the chosen design solution with the identified client	
3. Be able to implement and test products	P4: Develop the product in line with the agreed design solution		
	P5: Conduct product testing	M3: Analyse the results of testing and recommend improvements and enhancements to the design solution	
4. Be able to carry out acceptance testing with clients	P6: Carry out acceptance testing for users in line with the agreed design solution		D2 : Discuss with the identified client potential enhancements, upgrades and maintenance of the final product

SYNOPTIC ASSESSMENT

When learners are taking an assessment task, or series of tasks, for this unit they will have opportunities to draw on relevant, appropriate knowledge, understanding and skills that they will have developed through other units. We've identified those opportunities in the grading criteria (shown with an asterisk). Learners should be encouraged to consider for themselves which skills/knowledge/understanding are most relevant to apply where we have placed an asterisk.

ASSESSMENT GUIDANCE

LO1 Understand the product development life cycle

P1: Learners must outline the phases of the product development life cycle. They must include the main characteristics of each phase including its position within the product development life cycle. Evidence could be in the form of a written report, presentation with detailed speaker notes, a video of presenting the information to an audience, or an information guide on the product development life cycle.

M1: Learners are required to identify similarities and differences between a variety of different product development methodologies. Learners should clearly demonstrate their understanding through the comparison of the different methodologies. It is suggested that they include a summary of their findings in their evidence. The evidence could be in the form of a written report, a presentation or an information guide.

D1: Learners are required to make an informed judgement about the potential impact of constraints upon the product development life cycle. It is suggested that learners consider the potential impact that each constraint could have on the phases of the product development life cycle, highlighting where the major impacts could occur, together with possible knock on effects to subsequent phases. The evidence could be in the form of a written report or a presentation with very detailed speaker notes.

Learners could present evidence for the entire learning outcome as a tutor guide for learners wanting to study product development.

LO2 Be able to design products that meet identified client requirements

This learning outcome (LO) is about learners carrying out the requirements analysis phase and the design phase for an identified client and product. The scenario could be supplied by the centre or by learners. In all cases, it is important that the scenario, which learners are provided with, is sufficiently detailed to allow them to meet the assessment criteria fully.

P2: Learners must produce a product requirements specification that describes a product that meets the client requirements as given in the scenario. To achieve this, learners will need to carry out a requirements analysis, including prototyping if appropriate. The evidence will be a completed product requirements specification that covers all areas of the 'product requirements specification' section of the teaching content.

P3: For the first part of P3, learners must present outline solutions (two or more) to an identified client (i.e. from the scenario). Each outline solution must include hardware and software details functional and non-functional details and could include a prototype. Each outline solution must be presented in an

appropriate format. The presentation can be at a face to face meeting, via email exchange or another suitable method. However, there must be clear evidence that this has taken place.

The second part of P3 focuses on receiving feedback on the outline solutions, from the client. Learners must record the decisions made, any follow up actions, the implementation plan and deadline dates agreed with the client, the proposed acceptance test plan, and any additional resources that will be needed. The record, together with the outline solutions and product requirements specification, will be used to form the agreed design solution. The evidence of the decisions made could include annotated copies of the outline solutions and product requirements specification. The evidence produced for P3 should cover all items listed under 'Final design solution' in the teaching content.

M2: Learners are required to agree the inclusion of features that extend or enhance the functionality of the chosen solution with the client. It is expected that this will be an extension to P3. The extended or enhanced features and functionality may be asked for by the client or suggested by learners and will not have been included in the outline solutions presented in P3. Learners must record the full details of the extended or enhanced features and functionality, including any follow up actions and additional deadline dates agreed with the client. Learners are required to add these details to the agreed design solution. Learners should clearly identify the evidence pertaining to the extended or enhanced features and functionality.

LO3 Be able to implement and test products

This LO is about learners carrying out the implementation phase and the first part of the testing phase, using the design solution agreed with the client in the previous LO and including an implementation plan and proposed acceptance test plan.

P4: Learners must develop a product in line with the agreed design solution, following the implementation plan and keeping an implementation log. It is expected that the product will be complete and that it will meet all aspects of the agreed design solution. Evidence of development will consist of the completed implementation log (e.g. the annotated implementation plan); other documentation (e.g. photos, videos, and screenshots) and the actual product. In addition, learners must test the product as it is being developed; evidence of this unit testing and integration testing could be included in the implementation log. The implementation log should show that unit testing and integration testing have taken place during implementation.

P5: Learners must create a product test plan and use this to carry out testing of the completed product at the end of implementation. The product test plan must be sufficiently detailed to enable full testing against the agreed design specification. Learners must clearly evidence that a test plan has been created and followed.

M3: Learners are required to analyse the results of testing. This could be the results of any testing carried out on the product, i.e. unit testing and integration testing during implementation or product testing against the agreed design solution. Furthermore, learners are required to recommend improvements and enhancements (at least one of each) to the product. The evidence should give details and a justification of all improvements and enhancements. Learners are not required to implement the improvements and enhancements; the focus of M3 is on the analysis of the test results and the further development ideas that flow from that.

LO4 Be able to carry out acceptance testing with clients

P6: Learners must create an acceptance test plan, as detailed in the teaching content. This should be based on the proposed acceptance test plan, agreed with the client, as part of P3. The acceptance test plan must be used to carry out acceptance testing with a variety of target users, and as detailed in the agreed design specification). The evidence should be the completed acceptance test plan showing test outcomes, details of the deployment decision by the client and a hand-over document. This acceptance testing must cover functional and non-functional tests.

D2: Learners are required to discuss potential enhancements, upgrades and maintenance of the final product. Learners must discuss these changes with the original, identified client. The rationale for each potential enhancement, upgrade and maintenance activity must be clearly identified. Evidence will be a record of the discussions, together with full details of each potential enhancement, upgrade and maintenance activity. This could be in the form of meeting notes, audio/video recording of the meeting, or documentary evidence of an email exchange. **N.B.** Learners are **not** required to implement these changes.

Feedback to learners: you can discuss work-in-progress towards summative assessment with learners to make sure it's being done in a planned and timely manner. It also provides an opportunity for you to check the authenticity of the work. You must intervene if you feel there's a health and safety risk.

Learners should use their own words when producing evidence of their knowledge and understanding. When learners use their own words it reduces the possibility of learners' work being identified as plagiarised. If a learner does use someone else's words and ideas in their work, they must acknowledge it, and this is done through referencing. Just quoting and referencing someone else's work will not show that the learner knows or understands it. It has to be clear in the work how the learner is using the material they have referenced **to inform their** thoughts, ideas or conclusions.

For more information about internal assessment, including feedback, authentication and plagiarism, see the centre handbook. Information about how to reference is in the OCR *Guide to Referencing* available on our website: <http://www.ocr.org.uk/i-want-to/skills-guides/>.

EMPLOYABILITY SKILLS

Employability skills	Learning outcome
Communication	M1, D1, P2, P3, M2, P4, P5, M3, P6, D2
Problem solving	P2, M2, P4, P5, M3, P6, D2
Time management	P2, M2, P4, P5, P6, D2
Critical thinking	M1, D1, P2, M2, P4, P5, M3, P6, D2
Team working	P2, P3, M2, P6, D2
Negotiation	M2, D2
Decision making	P2, M2, P4, P5, M3, P6, D2

MEANINGFUL EMPLOYER INVOLVEMENT - a requirement for the Diploma (Tech Level) qualifications

The 'Diploma' qualifications have been designed to be recognised as Tech Levels in performance tables in England. It is a requirement of these qualifications for centres to secure for every learner employer involvement through delivery and/or assessment of these qualifications.

The minimum amount of employer involvement must relate to at least one or more of the elements of the mandatory units.

Eligible activities and suggestions/ideas that may help you in securing meaningful employer involvement for this unit are given in the table below.

Please refer to the *Qualification Handbook* for further information including a list of activities that are not considered to meet this requirement.

Meaningful employer involvement	Suggestion/ideas for centres when delivering this unit
1. Learners undertake structured work-experience or work-placements that develop skills and knowledge relevant to the qualification.	Learners may be able to participate in product developments while on work placement. You would need the support of the work placement for learners to practise working through the various development phases and complete appropriate documentation (even if only for their own personal use)
2. Learners undertake project(s), exercises(s) and/or assessments/examination(s) set with input from industry practitioner(s).	Learners could be given product development scenarios which have been produced with the aid of local employers. The employers could also be involved by acting as the client and target users during the product development.
4. Industry practitioners operating as 'expert witnesses' that contribute to the assessment of a learner's work or practice, operating within a specified assessment framework. This may be a specific project(s), exercise(s) or examination(s), or all assessments for a qualification.	If you have worked with employers to produce projects in point 2 above, they could be invited to act as an 'expert witness' and contribute to the assessment of those projects.

To find out more

ocr.org.uk/it

or call our Customer Contact Centre on **02476 851509**

Alternatively, you can email us on **vocational.qualifications@ocr.org.uk**



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