



Digital Industries Apprenticeship: Occupational Brief

Software Development Technician

September 2016

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Level 3 Software Development Technician Apprenticeship

Minimum Standards and Grading Criteria

This paper defines the minimum requirements for the knowledge, skills and behaviours defined in the standard, which are required for a pass. It also defines the criteria to be used for awarding the grade for merit or distinction. This paper should be read in conjunction with the Standard and Assessment Plan for the Level 4 Software Developer Apprenticeship

Overview of Grading

There are three sets of criteria on which the assessment and grading is made. The three criteria are

The What: what the apprentice has shown they can do,

The How: the way in which the work has been done

The With Whom: The personal and interpersonal qualities the apprentice has brought to all their work relationships

Each of these three criteria has minimum (expected) requirements, which must be satisfied for a pass.

Each of these criteria has a number of dimensions which should be considered to determine if the apprentice is significantly above the minimum (expected) level of quality

The purpose of grading is to differentiate between those apprentices whose work is at the expected level of quality against the totality of the skills, knowledge and behaviours specified in the standard and those whose work is significantly above this expected level

For a pass, each of the three sets of criteria must demonstrate at least the expected (minimum requirement) level of quality

For a merit, the What has to be significantly above the level of quality and one of either the How or the With Whom has to be significantly above the level of quality expected

For a distinction, each of the three sets of criteria must be significantly above the expected level of quality

The assessor takes a holistic judgement of whether or not their assessments demonstrate that the apprentice is “significantly above the expected level of quality” in each of these three areas and can then determine which grade should be awarded

The what – what the apprentice has shown they can do

Minimum Requirements

The following table shows what the minimum, expected requirements are for a pass on this criteria

Competency Standard	Minimum, expected, requirements for a pass
Logic: writes simple code for discrete software components following an appropriate logical approach to agreed standards (whether web, mobile or desktop applications)	Apprentices can write code to achieve the desired functionality using the appropriate tools and methods applicable to their organisation
Security: applies appropriate secure development principles to specific software components at all stages of development	Apprentices can apply security principals to all work within the development lifecycle Apprentices understand the importance of up to date software
Development support: applies industry standard approaches for configuration management and version control to manage code during build and release	Apprentices understand the business context and drivers during development Apprentices can communicate with customers, internal and external, to explain their work with the appropriate language relevant to their audience Apprentices understand the importance of version control at every stage within the development lifecycle
Data: makes simple connections between code and defined data sources as specified	Apprentices can link to a range of database types and embed data queries within their code
Test: functionally test that the deliverables have been met or not	Apprentices can test and analyse their code to identify errors as soon as possible in the coding process and on an interactive basis Apprentices can design manual tests for their product Apprentices understand expected results and acceptance criteria during testing
Analysis: follows basic analysis models such as use cases and process maps	Apprentices can read and understand data to ensure they know and can meet the customers' requirements Apprentices can identify and represent required functionality (e.g. use cases) Apprentices can identify and represent activity workflow (e.g. process maps)
Development lifecycle: supports the Software Developers at the build and test stages of the software development lifecycle	Apprentices can work as part of a team that understand their process within the development lifecycle Apprentices can show initiative during development and take responsibility for their own work Apprentices can work flexible to assist with other member of the team during development
Quality: follows organisational and industry good coding practices (including for naming, commenting etc.)	Apprentices can identify and follow standards and good practice that can improve programming efficiency, style and quality, including: <ul style="list-style-type: none"> programming standards, both organisational and external

	<ul style="list-style-type: none"> • generic best practices including readability, reusability, maintainability • best practice approaches of different paradigms and language
<p>Problem solving:</p> <ul style="list-style-type: none"> • solves logical problems, seeking assistance when required (including appropriate mathematical application) • responds to the business environment and business issues related to software development 	<p>Apprentices can use at least one problem solving tool and technique to identify and resolve programming issues</p> <p>Apprentices can apply structured problem solving methods</p> <p>Apprentices can apply problem-solving techniques to programming activities</p> <p>Apprentices can demonstrate they know how and where to seek assistance dependent at what stage of development is appropriate</p>
<p>Communication: clearly articulate the role and function of software components to a variety of stakeholders (including end users, supervisors etc.)</p>	<p>The apprentice should be able to use a minimum of 3 tools to communicate</p> <ul style="list-style-type: none"> • Oral • Face-to-face • Remote • Diagrammatic <p>The apprentice should be able to document work done in accordance with agreed procedures</p> <p>The apprentice must be able to explain 3 types of communication styles to ensure cultural awareness and appropriateness for customer is taken into account</p>
<p>Operates effectively in their own business's, their customers' and the industry's environments</p>	<p>Apprentices can demonstrate working within operational requirements such as health and safety, budgets, brands and normal business protocols</p>
<p>User interface: develops user interfaces as appropriate to the organisations development standards and the type of software development being developed</p>	<p>Apprentices understand the fundamental concepts of human-computer interaction or user experience design, the development practices leading to a high-quality user interface, and the programming techniques required to construct a graphical user interface</p> <p>Apprentices understand how to interact with screen or UI designers to ensure the logic layer integrates with the user interface</p> <p>Apprentices understand how to interact with testers to optimise the user interface</p>

The What – what the apprentice has shown they can do

Criteria for a Merit or Distinction

The following table shows what the apprentices would need to demonstrate to be assessed as significantly above the expected level for what they have done

Dimensions	Description of what significantly above the expected level of quality looks like
Breadth – the range of tools and methods understand and applied	Understands and applies a wide range of tools and methods Accurately and appropriately applies and effectively implements the right tools and methods in a variety of different situations
Depth – the level to which these tools and methods are understood and applied	A sophisticated user - fully exploits the functionality/capability of the tools and methods Extensive and deep understanding of different tools and methods and how and why they can be applied in different contexts
Complexity – the extent and prevalence of inter-related and inter-dependant factors in the work and how well the apprentice has dealt with these	Deals confidently and capably with a high level of interrelated and interdependent factors in their work

The how: the way in which the work has been done

The following table shows what the minimum, expected requirements are for a pass on this criteria.

Competency Standard	Minimum expected requirements for a pass
Apprentices can demonstrate the full range of skills, knowledge and behaviours required to fulfil their job role	<p>Knows what skills, knowledge and behaviours are needed to do the job well</p> <p>Are aware of their own strengths in the job role, and any areas for improvement</p> <p>Appreciate who else is important, for them to do their job and fulfil the role effectively (e.g. colleagues, managers, other stakeholders)</p> <p>Are aware of potential risks in the job role (e.g. security, privacy, regulatory)</p> <p>Use personal attributes effectively in the role, e.g. entrepreneurship</p> <p>Understand how the job fits into the organisation as a whole</p>
Apprentices can demonstrate how they contribute to the wider business objectives and show an understanding of the wider business environments	<p>Understands the goals, vision and values of the organisation</p> <p>Aware of the commercial objectives of the tasks/ projects they are working on</p> <p>Understands the importance of meeting or exceeding customers' requirements and expectations</p> <p>Is in tune with the organisation's culture</p> <p>Aware of the position and contribution of the organisation in the economy</p> <p>Understands the key external factors that shape the way the organisation function, e.g. regulation</p> <p>Knows how the organisation can gain advantage in the industry, e.g. through innovation, technology, customer service etc.</p>
Apprentices can demonstrate the ability to use both logical and creative thinking skills when undertaking work tasks, recognising and applying techniques from both.	<p>Logical thinking:</p> <ul style="list-style-type: none"> • Understands initial premise(s) and preconditions • Recognises the conclusion to be reached • Proceeds by rational steps • Evaluates information, judging its relevance and value • Supports conclusions, using reasoned arguments and evidence <p>Creative thinking:</p> <ul style="list-style-type: none"> • Explores ideas and possibilities • Makes connections between different aspects • Adapts ideas and approaches as conditions or circumstances change
Apprentices can show that they recognise problems inherent in, or emerging during, work tasks, and can tackle them effectively	<p><i>Problem-solving:</i></p> <ul style="list-style-type: none"> • Analyses situations

	<ul style="list-style-type: none"> • Defines goals • Develops solutions • Prioritises actions • Deals with unexpected occurrences
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The How: the way in which the work has been done

Criteria for a Merit or Distinction

The following table shows what the apprentices would need to demonstrate to be assessed as significantly above the expected level for the way in which the work has been done

Dimensions	Description of what significantly above the expected level of quality looks like
Responsibility – the scope of responsibility and level of accountability demonstrated in the apprentices work	<p>Undertakes work that is more complex, more critical or more difficult</p> <p>Works independently and takes high level of responsibility</p>
Initiative	<p>Independently demonstrates an ability to extend or enhance their approach to work and the quality of outcomes</p> <p>Doesn't just solve the problem but explores creative or innovative options to do it better, more efficiently, more elegantly or to better meet customer needs</p>
Delivery focus – the extent to which the apprentice has shown they can grasp the problems, identify solutions and make them happen to meet client needs	<p>Shows strong project management skills, in defining problem, identifying solutions and making them happen</p> <p>Demonstrates a disciplined approach to execution, harnessing resources effectively</p> <p>Drives solutions – with a strong goal focused and appropriate level of urgency</p>

The with whom: the personal and interpersonal qualities the apprentice has brought to internal and external relationships

Minimum Requirements

The following table shows what the minimum, expected requirements are for a pass on this criteria

	Minimum expected requirements for a pass
<p>Apprentices can manage relationships with work colleagues, including those in more senior roles, customers/clients and other stakeholders, internal or external and as appropriate to their roles, so as to gain their confidence, keep them involved and maintain their support for the task/project in hand</p> <p>Apprentices can establish and maintain productive working relationships, and can use a range of different techniques for doing so.</p>	<p>Managing relationships:</p> <ul style="list-style-type: none"> • Understands the value and importance of good relationships • Influences others by listening to and incorporating their ideas and views • Acknowledges other people's accomplishments and strengths • Manages conflict constructively • Promotes teamwork by encouraging others to participate <p>Customer/client relationships:</p> <ul style="list-style-type: none"> • Understands their requirements, including constraints and limiting factors • Sets reasonable expectations • Involves them in decisions and actions • Interacts positively with them • Provides a complete answer in response to queries ('transparency', 'full disclosure') <p>Stakeholders:</p> <ul style="list-style-type: none"> • Understands who they are and what their 'stake' is • Prioritises stakeholders in terms of their importance, power to affect the task and interest in it • Uses stakeholders' views to shape projects early on • Gains support from stakeholders, e.g. to win resources • Agrees objectives
<p>Apprentices can communicate effectively with a range of people at work, one-to-one and in groups, in different situations and using a variety of methods.</p>	<p>Intention/purpose:</p> <ul style="list-style-type: none"> • Understands the purpose of communicating in a particular situation or circumstance (e.g. inform, instruct, suggest, discuss, negotiate etc.) • Checks that the person/people with whom one is communicating also understand the purpose

<p>Apprentices can demonstrate various methods of communication, with an understanding of the strengths, weaknesses and limitations of these, the factors that may disrupt it, and the importance of checking other people's understanding.</p>	<ul style="list-style-type: none"> • Is sensitive to the dynamics of the situation • Is aware of anything that might disrupt the effectiveness of the communication (e.g. status, past history) <p>a. Method:</p> <ul style="list-style-type: none"> • Chooses a good, appropriate method for the situation • Aware of the limitations of the chosen method, and the possible risks of miscommunication (e.g. ambiguity) • Takes account of the affective dimensions of the method (e.g. body language, tone of voice, eye contact, facial expression etc.) <p>b. Execution:</p> <ul style="list-style-type: none"> • Expresses self clearly and succinctly, but not over-simplifying • Checks that the other person/people understand what is being expressed • Takes account of the potential barriers to understanding (e.g. filtering, selective perception, information overload) • Modifies the purpose and methods of communication during a situation in response to cues from the other person/people
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The With Whom: the personal and interpersonal qualities the apprentice has brought to internal and external relationships

Criteria for Merit or Distinction

The following table shows what the apprentices would need to demonstrate to be assessed as significantly above the expected level for the personal and interpersonal qualities the apprentice has brought to internal and external relationships

Dimensions	Description of what significantly above the expected level of quality looks like
<p>Scope and appropriateness – the range of internal and external people and situations that the apprentice has engaged appropriately and effectively with</p>	<p>Internally – works alone, 1:1, in a team and across the company with colleagues at all levels</p> <p>Externally – works with customers, suppliers and partners in a variety of situations</p> <p>Reads situations, adapts behaviours, and communicates appropriately for the situation and the audience</p>

Reliability – the extent to which they perform and behave professionally	Can be trusted to deliver, perform and behave professionally, manages and delivers against expectations, proactively updates colleagues and behaves in line with the highest values and business ethics
A role model and exemplar to others	Actively inspires and leads others, takes others with them, leads by example

Annex: Software Development Technician: Knowledge and Understanding

Knowledge and Understanding is assessed on programme through Knowledge Modules and Vendor or Professional Qualifications

Knowledge Module 1: Software Development Context and Methodologies (for Level 3 Software Development Technician Apprenticeship)

The Knowledge Standards	Definition of the Minimum Requirements
Understand the business context and market environment for software development	Knows that software development is undertaken across many industries, but that whilst the processes and methods are broadly similar the data and rationale can be very different Understand that it is important to keep digital processes up to date and web systems responsive to user needs Understand that some business are virtual web based enterprises, whilst some use web and digital services to engage with clients and customers
Understand the structure of software applications	Understands the underlying architecture of software applications Understands the importance of linking software to databases to store new data inputs collected through applications and to present information choices to users
Understands all stages of the software development lifecycle	Understands that software is developed through various phases referred to as the software development lifecycle (SDLC) Understands the main phases of the software development lifecycle and the main activities in each stage
Understand the role of configuration management and version control systems and how to apply them	Understand that code development needs to be managed and controlled using configuration management tools to store incremental developments of code as it is being developed Understand that version control manages updates to code and also development of software for different platforms
Understand how to test their code (e.g. unit testing)	Understand the different types of software testing (e.g. unit testing, integration testing, load testing etc.) and how to apply them
Recognise that there are different methodologies that can be used for software development	Understand that there are a wide range of variations of software development methodologies including waterfall and agile based methods and how to apply them
Understand the particular context for the development platform (whether web, mobile, or desktop applications)	Understand that software development needs to reflect the platform the software will be deployed onto (e.g. web, mobile or desktop) and that software may be for a single platform or increasingly multiple platforms
Understands their role within their software development team	Understand the various roles that exist within software development teams and how these relate to each other (e.g. business analyst, requirements engineer, software designer, software developer, software tester, software project manager, software release engineer etc.)

The following Vendor or Professional Certifications exempt apprentices from this knowledge module:

None identified

Knowledge Module 2: Programming (for Level 3 Software Development Technician Apprenticeship)

The Knowledge Standards	Definition of the Minimum Requirements
Understand how to implement code following a logical approach	Understand and apply the fundamental principles and concept of software coding, including abstraction, logic, algorithms and data representation Understand how to write software code in order to solve problems Understand how to create and debug programs
Understand how their code integrates into the wider project	Understand the roles and activities needed at each stage of software development Understand how software components are managed and controlled and how these are brought together into software solutions Understand what team-working aspects are needed to ensure effective delivery of software projects
Understand how to follow a set of functional and non-functional requirements	Understand the differences between functional and non-functional requirements and how these are used to drive software development activities Understand how to review requirements and consider the testability of each requirement
Understand the end user context for the software development activity	Understand the needs of the user and the environment that the software will be used in (e.g. by a doctor in a hospital, or by a consumer through a web-site, or by an engineer in a manufacturing plant)
Understand how to connect their code to specified data sources	Understand the importance of seamlessly connecting applications to databases that can be used to: <ul style="list-style-type: none"> • store new information (e.g. orders or customer information) • extract and displayed stored data (e.g. on products, pricing etc.)
Demonstrate knowledge of database normalisation	Understand that normalisation is a method of reducing the complexity of multiple database tables into smaller and well-structured relations Understand that a key principle of normalisation is to ensure that information or data should be stored only once
Understand why there is a need to follow good coding practices	Understand that good coding practices aid the efficiency and quality of coding development Understand that there are a range of published open standards and organisational standards, where to source these and how to apply them
Understand the principles of good interface design	Understand the issues associated with designing and developing interactive systems Understand the main techniques and technologies used for interface design Appreciate the importance of usability when developing interactive systems
Understand the importance of building in security to software at the development stage	Understand what is meant by “building security in” and that this includes: <ul style="list-style-type: none"> • the key steps in the design process to identify and incorporate security requirements into software development • the key techniques for defensive programming such as input checking

The following Vendor or Professional certifications exempt apprentices from this knowledge module:

None identified