

# BCS Certificate in System Development Essentials

## Sample Paper A

### 1 Hour Examination

**NOTE:**

These are sample questions, with marking guidelines, for each of the BCS BSD Diploma certificate modules. Each sample question has been written to help candidates prepare for the module examination by providing an example of the general approach adopted by these questions. Therefore, the total marks assigned to the sample questions will vary depending upon the certificate module.

The BCS Examination Providers are accredited to set the examinations for the certificate modules and part of the accreditation process requires Providers to demonstrate their ability to set rigorous examination papers. The sample questions are not intended for use by Examination Providers as a basis for setting their own examination papers and should not be viewed as a template for these examinations.

## Scenario 1

T-shirts-R-us is a company that prints computer-generated designs onto T-shirts and sells these to businesses and the general public. It has a fully-networked, 20-user computer installation which is 3 years old, and has systems to support printing-job control, accounting and sales-order processing. It operates from a rural site in the north of the country.

The management team of T-shirts-R-us is shown in the organisation chart below. The Marketing Director and the Finance/IT Director have recently put a business case to the Chief Executive for the creation of a social media page for advertising the company's products. This page will also provide customers with the option of viewing products at a simple or elaborate level of detail, as well as grouping products into three main ranges: shirts; jeans and "company wear".

The social media project has been authorised by the Chief Executive, who has allocated a budget and has handed over day-to-day control of the project to the Marketing Director, supported by his head of Advertising and Web Editing, Alison King.

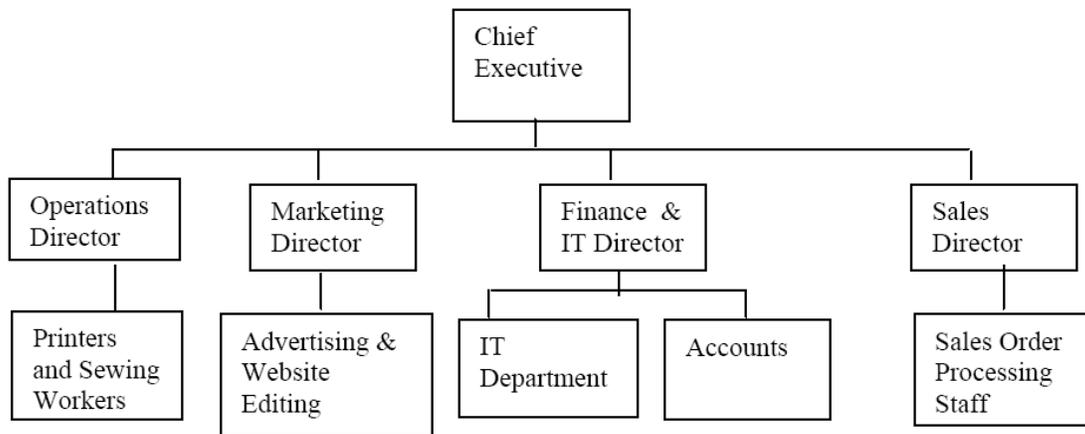
The development is to be handled by an "in-house" team. Terry Bull, the Project Manager, is using an Agile approach to this project. He has explained the principles of prioritisation and timeboxing to everyone in a thirty minute session a few weeks ago. Terry has allocated three IT developers, Tom, Dick and Harry to the job. Three representatives of the business have also been identified to help with the project: these are Mary from Marketing, Sally from Sales and Ann from Accounts.

The Sales Director has insisted that the new offering should also be used to capture customer details so that they can be linked in to the company's main system.

The most experienced developer, Tom, has developed three web sites before, for other organisations. Dick and Harry have never developed a web site of this type before but both have attended a training course to learn all the necessary development techniques. Tom has some Agile development knowledge and is experienced in a range of web-based development languages.

Mary, Sally and Ann have never been asked to participate in an IT development project before. They have had no specific project training, but are keen to be involved and are sure they can squeeze in a few sessions with the developers, alongside their busy everyday schedules. They are not officially allocated any time away from their normal jobs for the project but should be able to commit time to the project as required to provide knowledge of the business. Other business people will try to be available when necessary, but of course their normal jobs will always have priority. The developers are assigned full-time to the project. The Marketing Director has said that the new features need to be operational in four months, to coincide with the start of the company's busiest time of the year and to take advantage of new advertising trends.

An initial Feasibility Study has been completed and a timebox of four weeks has just been run to agree the high level business requirements.



**Note:** A total of 50 marks are available for this paper.

- 1 As this is to be an Agile project, it will be necessary to allocate people to the **KEY** roles prior to commencement. The only role that has been allocated so far is that of Project manager (Terry Bull). As the Agile coach on this project you have been asked to recommend who should be allocated to these roles giving the reasoning behind these allocations. In addition to proposing individuals for each role you should also suggest how these would be split into two teams – the project team and the solution development team.

The roles you have been asked to fill are:

- Executive sponsor
- Business sponsor
- Business ambassador/ Ambassador user
- Business advisor
- Team leader
- Solution developer
- Solution tester

You should also identify any additional roles you may wish to introduce to complete the teams.

**[12 marks]**

- 2 As part of web/social networking development projects a number of fact finding/investigation techniques may be employed. With respect to the T-shirts-R-us scenario specifically, describe how the following techniques might be applied:

- Prototyping
- Scenario analysis

**[8 marks]**

- 3 Identify **four** techniques that might be applied during the T-shirts-R-us project to maximise the quality of the resulting software solution giving specific examples of how they might be applied.

**[12 marks]**

## Scenario 1 Marking scheme

### Q1.

Executive sponsor – Chief Executive

Business sponsor – Marketing Director

Business ambassador/ Ambassador user – Head of Advertising and web editing

Business advisor – Mary, Sally, Ann and the Sales Director

Team leader - Tom

Solution developer – Dick and Harry

Solution tester – Harry and Dick (technical testing), Head of Advertising and web editing (business testing)

Project team:

- Executive sponsor
- Business sponsor
- Project manager

Solution development team:

- Business ambassador/ Ambassador user
- Business advisor(s)
- Team leader
- Solution developer(s)
- Solution tester(s)

Possible extra roles:

- Technical co-ordinator
- Business Analyst

**[total 12 marks]**

### Q2.

1 mark per valid point to a maximum of 4 points for each of the techniques.

Prototyping:

- Functional prototyping
- Performance and capacity prototyping
- Usability prototyping
- Timeboxed prototyping session with appropriate Business advisor

Scenario analysis:

- Test cases from Business ambassador and Business advisor focus groups
- Used to feed into prototyping, testing and subsequent training
- To validate requirements
- To identify missed requirements

**[total 8 marks]**

### Q3.

1 mark for identification of each suitable techniques, 2 mark for appropriate example of its application.

Possible techniques that could be selected are:

- Joint development/prototyping
- Regular review meetings/workshops/walkthroughs
- Requirements driven testing
- Peer group reviews
- Adherence to standards – e.g. templates, best practice guidance
- Clear acceptance criteria on requirements
- Good configuration management and change control
- Formalized communications both between team members and between the project team and the development team
- Access to experienced Agile coach/mentor

**[total 12 marks]**

## Scenario 2

'SkoolTech' is a system development company approved to develop and implement IT for schools. They have recently been approached by St Henry's Primary school to develop an on-line payment system enabling parents to make payments to the school directly.

St Henry's Primary school is a large school with about 830 pupils across 7 school years (Reception class and Years 1 -6).

The school handles and manages two different kinds of payments:

- Regular term time payments (i.e. dinner money, milk, after school clubs, swimming and music lessons).
- One off payments (i.e. school trips, school uniform).

The school office is manned by 3 secretaries' (Hazel, Bill and Jane) but handling and managing all the individual payments through the school reception is putting a strain on the school office. There is a trip coming up next term for both Year 4 & 5 at the same time which means payments from approximately 240 parents will need to be taken over a two week period. Hazel and Bill are well versed in computers and have spreadsheets already in place coupled with a well understood process to manage the payments manually. Jane is happy to follow the process and use the spreadsheets but is not as comfortable with new IT. The school is hoping that an on-line payment system will significantly relieve the burden on the school office.

The school also has a very active and well represented 'parents forum'. Where on-line payments have been a topic of discussion for some time and is much sought after by the parents, many of whom work full time. Due to this it is important that any new payment system also meets the parent's requirements.

### **You work for SkoolTech and are the System Analyst/designer for this project**

You will be working in a small team with a Project Manager, a Developer and a Tester. Ted is the Project Manager who has a lot of experience of managing projects although much of this has been a traditional project management approach following a Waterfall development lifecycle. Arran is the youngest and least experienced member of the team and although he only has 2 years working experience he is well versed in Java and web based applications so he will fill the Developer role. Arran has also done some Agile training and has worked on one agile project. Pam is the Tester but she has had over 10 years working in various system development roles, including developer, systems analyst, tester and some project management. She is used to working iteratively and is well versed in the Rational Unified Process. She has had little exposure, however, to agile development and is not comfortable with new approaches such as SCRUM which appear to jump straight into coding before the requirements have been defined.

- 1 Which System Development Lifecycle would you suggest to be the most appropriate to use for developing the school on-line payment system? Please give reasons, relating to the scenario where possible, that describe why this approach is more appropriate than another.

**[4 marks]**

2 Provide 3 advantages of using your suggested approach and 1 disadvantage.

[4 marks]

3 Arran suggests that the goal of the **first** release should be a version of the system that can accept the payments for the upcoming Year 4 & 5 trip. But Ted thinks a better goal should be to design the database tables and start transferring the details in the spreadsheet into them. What are the advantages of each of these approaches?

[4 marks]

### Scenario 2 marking scheme

**Q1.** This answer should be free-format and answers will vary. As there is already a working, albeit manual, system in place the requirements are well understood and so a waterfall or Spiral approach that is designed to deliver new green field solutions should not be considered the most appropriate. Nor should any approach that delivers 'big bang' as this is risky as problems may not come to light until the system has been implemented and by which time changes are costly. However if the candidate details these approaches in terms of delivery incrementally (i.e. waterfall combined with evolutionary or Spiral combined with prototyping) which indicate an incremental development, test and delivery, marks should be awarded.

Points that should be made are, for example:

- Any development lifecycle that delivers or is used incrementally should be considered appropriate. And so the most obvious answer should be an incremental approach.

Incremental development is most appropriate for the following reasons:

- Incremental development defines working pieces of functionality at the user level and the whole basis for this system is to enable parents to make payment on-line, relieve manual input for the school office, and manage school payments, all of which are user functionality.
- Each increment is a piece of working software that is tested, executed and delivers a piece of user functionality (i.e. not big bang).
- Incremental approach can focus on delivering functionality in a phased approach based on customer/user need. For example, the two different types of payments detailed in the scenario are 'Regular term time' and 'one off' payments, each of which could be an increment.

Award 1 mark for identifying an incremental development lifecycle and 1 additional mark for each point made as to why an incremental development lifecycle is most appropriate and/or for referring the point accurately back to the scenario up to 3 additional marks,

[total 4 marks]

**Q2.** Award 1 mark for each advantage correctly identified up to a total of 3 marks, and 1 mark for a disadvantage identified, total 4 Marks. (1/2 marks may be awarded if the candidate is along the correct lines but answer does not justify a full mark).

Advantages that might be offered include:

- Allows risks to the project to be addressed incrementally and reduced early in the lifecycle.
- Early increments can be scheduled to cover the most risky parts of the architecture. When the architecture is stable, development can be speeded up.
- Benefits users, managers and developers who see working functionality early in the lifecycle.
- Each increment is, effectively, a prototype for the next increment.
- Gives users confidence that you can deliver what they need.
- Incremental delivery enables users to take on board the business change in stages (i.e. not overwhelmed by the change).

Disadvantages that might be offered include:

- Increments need to be relatively small.
- Mapping requirements to increments may be hard.
- An incremental approach can lead to developers coding before they have really understood the requirements for that increment.
- Users might not find value in every increment (what's in it for me?)

**[total 4 marks]**

**Q3.** This answer will be free-format and answers will vary. Award 2 marks for an answer that justifies why that delivery is beneficial to the business and its customers and addresses high risk. A further 1 mark can be awarded for each justification for, or against, the suggestion up to a total of 2 marks. Total 4 marks awarded overall.

Points being sought are, for example:

The best approach would be to build a system that can be used for the Year 4 and 5 trip. This means that the delivered version will provide immediate value to the business – the secretary workload should be less in the new system. This approach will also test the assertion that the new system will reduce workload, and the basic functionality can be tested for a subset of users. It will help the customer understand quite quickly whether they will get the benefits they expect.

Bill's suggestion would deliver some functionality and reduce some (probably minor) technical risk, but it will not deliver anything useful to the business. They will still have to use the old system for the Year 4/5 trip, and will have to go through at least another development cycle before the business knows this is the right solution.

Other advantages in Arran's approach, such as:

- Timeframe may make it difficult (no room for slippage). This is both an advantage and a disadvantage!
- An end to end system may have dependencies (credit card merchant for example), but this can be overcome by having manual steps in the process for the first version
- All the stakeholders are involved, as it is an end-to-end demonstration of limited capability.

- To deliver this, there might be some bespoke features that will need to be removed in future versions (e.g. the trip amount may be hard coded, or only one type of credit card accepted).

Other advantages in Bill's approach, such as:

- The team understand this part of the system, so should be able to deliver it quickly.
- There are fewer stakeholders involved.
- The database tables are an architecturally important part of the system so should be proven first, but as the data model might change as the problem is understood, fixing the database tables at the start could lead to problems later.

**[total 4 marks]**

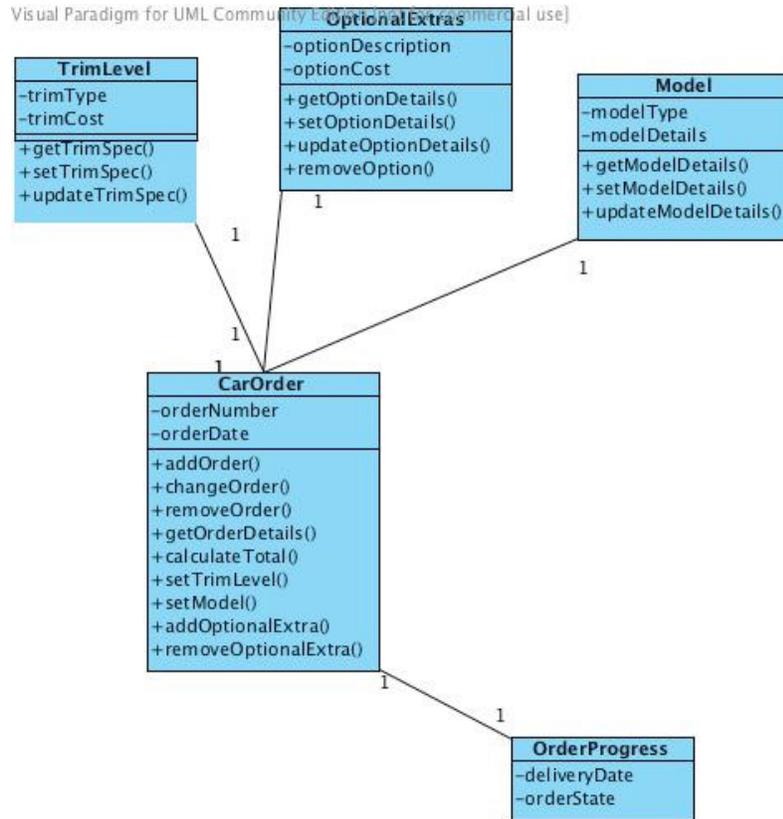
### **Scenario 3**

Tiny Motors Corp is an automobile manufacturer with a chain of dealerships in the UK. They manufacture 3 different models of car, that each comes in 3 trim levels. There are a range of optional extras such as satellite navigation, full leather upholstery, towbars, etc that customers can add.

Currently, customer details are stored in a spreadsheet where each customer is labelled as either prospective (may be interested in buying), previous (have previously bought a car), and current (purchasing a car, but haven't yet taken delivery). Order details are not stored in this spreadsheet as there is another spreadsheet for customers who have placed an order showing what they have ordered, the total cost of the order and which salesperson sold the car to them. Finally they have a database, linked to the manufacturer that tracks the progress of ordered cars, Details of progress are provided by the manufacturer and updated automatically in the tracking database.

Due to the many overlaps between these different data storage systems they have set up a project to unify the three systems into a single showroom IT system that sales staff can use for all three functions; Managing Customers, Orders, Tracking orders.

The project is using the Unified Process, and is in the Elaboration Phase. Bob has already built a logical data model that combines the Orders and Tracking orders functions and is below:



A snapshot from the Customers database used to 'Manage Customers', with contact details removed, is shown below:

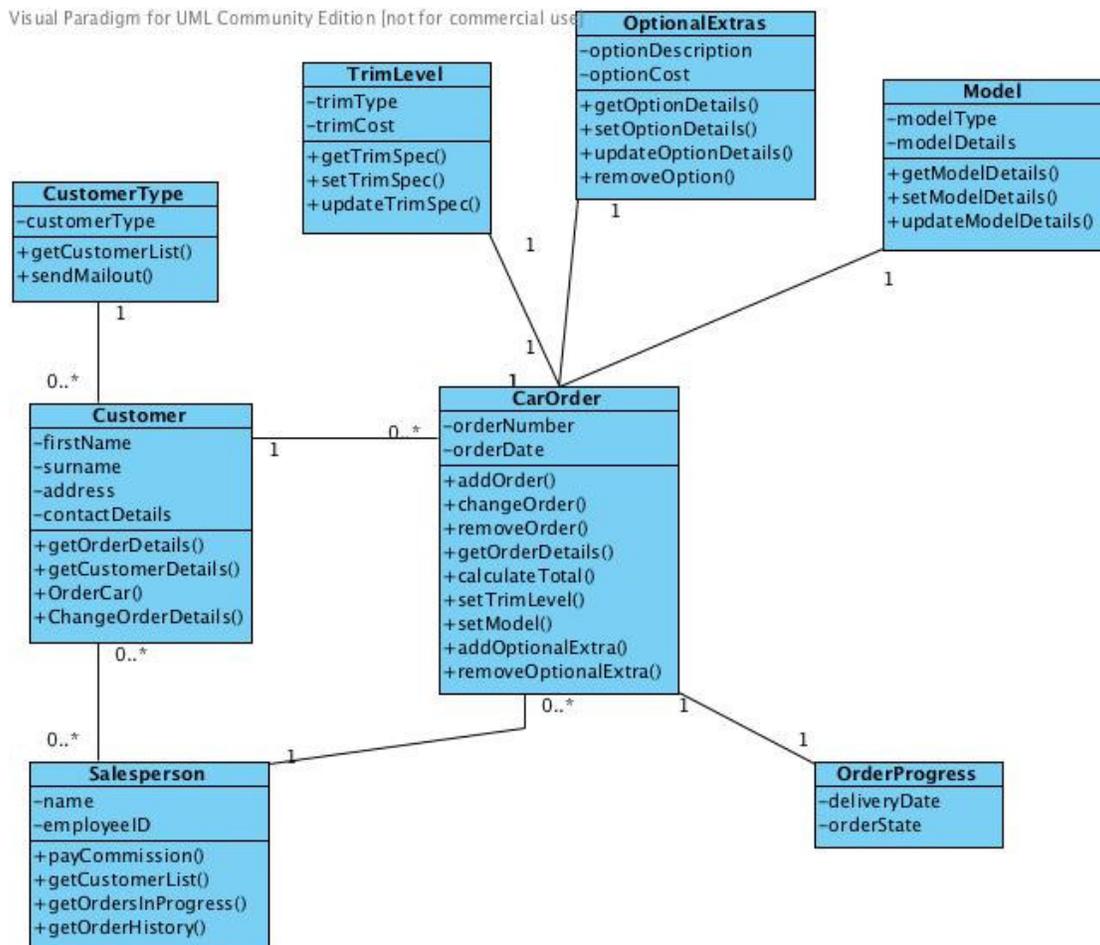
Customer ID	First Name	Last Name	Address 1	email	Phone	Customer Type	Salseperson	Order ID
1	Bill	Abbot	4			Ordered	Richard Pearson	34657
2	Steve	Montjoy	101			Prospective		
3	Pat	Hew	54			Previous		
4	W	Morrison	Farm Cottage			Current	Bob Salway	98143
5	Simon	Brestle	87			Prospective		
6	H	Kewitt	3			Prospective		
7	M	Bradley	1234			Prospective		
8	Chontelle	Hill	Flat10			Prospective		
9	Mary	Morrison	7			Previous		
10	William	O'Hara	Dove House			Prospective		
11	Ben	Sullivan	891			Current	Ruby Moran	20034
12	Robert	Nixon	34			Current	Ruby Moran	87263
13	Jasmine	Bentley	76			Prospective		

- 1 Bob has already created a logical data model combining the 'order' and 'tracking order' functions. You have been asked to extend the model based on the information given in the Customer database spreadsheet. For one of the classes you have added you must also create at least 4 attributes and 2 methods.

[6 marks]

### Scenario 3 Marking scheme

Q1. Models may vary slightly but as a minimum should include the 'Customer' and 'Sales Person' classes. 'Customer Type' may also be a class but showing it as an attribute on the 'Customer' class would not be wrong. A example diagram showing additional classes is given below:



Award 1 mark for adding 'Customer' and 1 mark for 'Sales Person'. A further 0.5 mark should be awarded for each attribute correctly identified (one class only), up to 2 marks and a further 0.5 marks for each correct method identified (same class only), up to 2 marks, total of 6 marks.

[total 6 marks]