



Rewarding Learning

ADVANCED
General Certificate of Education
2023

Centre Number

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Candidate Number

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Software Systems Development

Unit A2 1

Systems Approaches and
Database Concepts



[ADV11]

ADV11

THURSDAY 1 JUNE, AFTERNOON

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in questions **3**, **5(e)** and **6(b)**.



1 Thomas, a trainee systems analyst at Software Solutions Consultancy (SSC), has begun the process of gathering user stories having interviewed the staff in the gift shop.

(a) Complete two additional user stories for the gift shop using the templates below. [4]

As a shop manager
I want to have accurate stock prices
So that I can tell customers how much an item really costs

As a shop manager
I want
So that

As the business owner
I want to view sales analysis
So that I can make decisions on pricing

As the business owner
I want
So that



(b) Sinead, the senior analyst at SSC, has noted that many issues have not been properly specified in relation to the gift shop. She will use particular fact-finding techniques to gather information.

Complete the table below:

Technique	Required information
	How the stock-taking process on Monday 19th September 2022 was conducted and what was recorded.
	How nursery stock requirements are gathered.
	The exact detail recorded on order forms for Tuesday 13th September 2022.
	What customers think of the service in the gift shop.

[4]

[Turn over

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24ADV1103

2 The development team at SSC wish to make Harry aware of possible methodologies that could be used in the development process.

Complete the paragraphs below by selecting the correct words or phrases from the selection provided. Words and phrases may be used more than once.

Agile	customer	gift shop	phases	testing
Anne	developer	Harry	project	Testing
budget	documentation	incremental	RAD	Traditional
café	DSDM	integrated	rigid	user
complete	flexibility	iteration	SCRUM	working software
cost	gardening	iterative	sequential	XP

_____ methodologies are performed in an _____ and _____ manner. There is significant emphasis on the role of the _____ in the development of a system.

Examples of this type of methodology include _____, _____ and _____.

These methods promote _____ over _____.

In _____ methods, entire features are developed within each _____. _____ occurs throughout the development process.

_____ approaches to system development are _____ and _____ in terms of how the process flows.

There is limited _____ involvement. _____ is performed at the end of the lifecycle. Usually, _____ is delivered late in the life cycle.

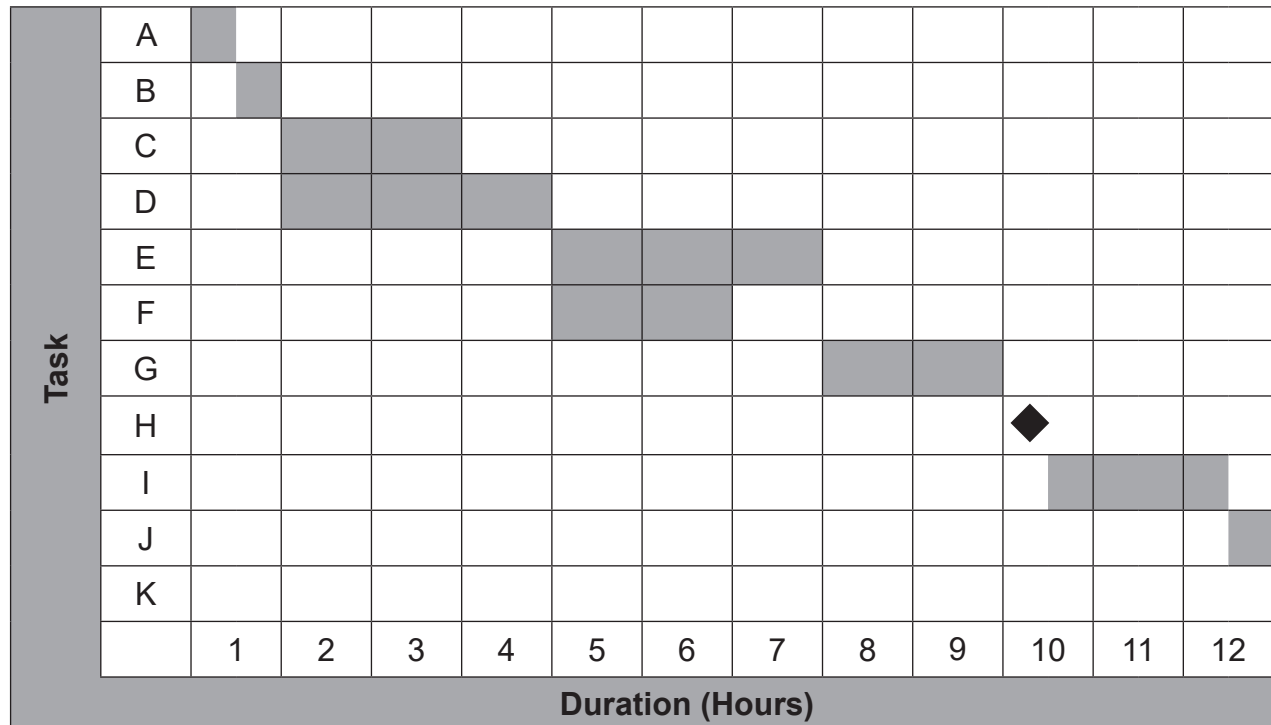
[9]



- 4 Ben, the project manager, has asked Harry to list the typical steps involved in the process of creating quotations for contract work, along with the hours taken and any predecessors. The steps are presented in the precedence table shown below.

ID	Task	Duration (hours)	Predecessors
A	Record customer request	0.5	-
B	Arrange site visit	0.5	A
C	Conduct site visit	2	B
D	Identify tasks involved	3	B
E	Itemise and cost materials	3	C, D
F	Create work schedule	2	D
G	Create quotation	2	E, F
H	Agree quotation	0.5	G
I	Create contract	2	H
J	Assign staff	0.5	I

The following GANTT chart has been produced from the table:



(a) Explain the significance of task H.

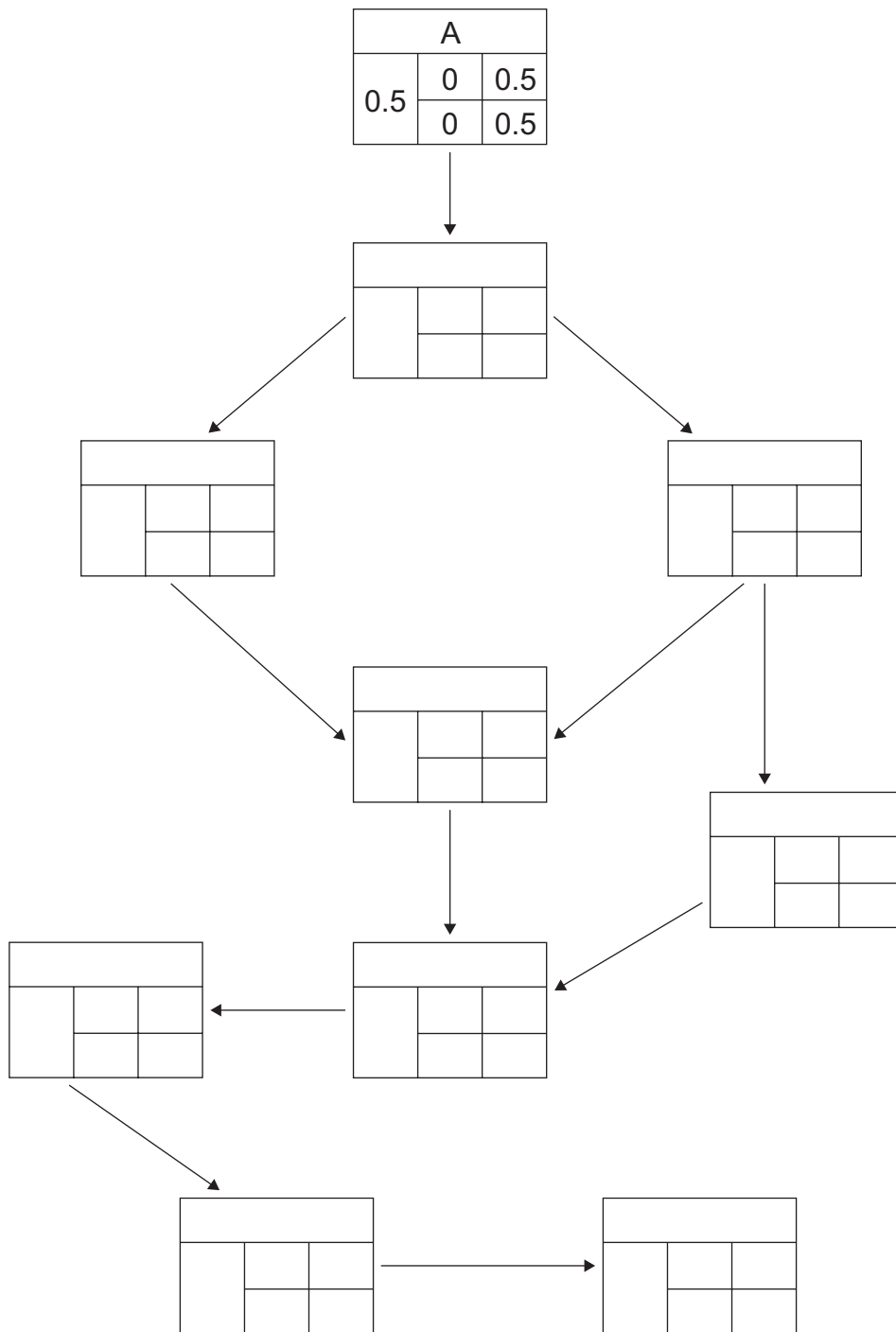
[2]

(b) Describe one problem with the use of a GANTT chart to schedule the processes outlined in the precedence table.

[2]



(c) Use the tasks from the precedence table to complete the PERT chart below.



[9]



(d) Identify the critical path.

_____ [1]

(e) What is the impact of reducing the duration of activity F by 1 hour?

_____ [1]

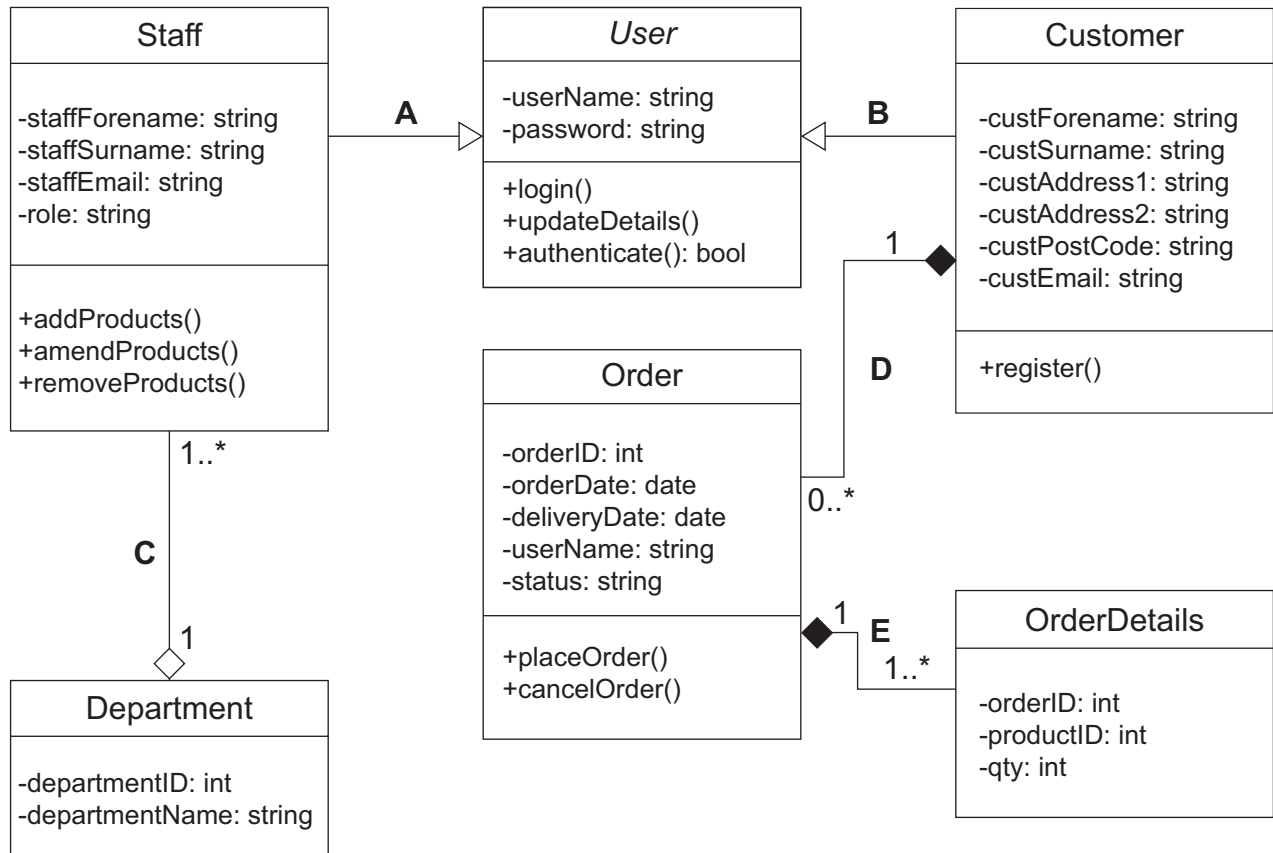
[Turn over

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24ADV1109

5 Work has begun on the development of the on-line aspect of the business. The junior analyst has completed a set of class diagrams for Sinead to examine, as shown below.



(a) Identify and explain the type of relationship labelled A and B.

[2]



(b) Sinead has suggested that the attributes of the User class should be protected. Define each of these attributes as protected.

[2]

(c) Sinead explains that a composite relationship between two class diagrams means that one class cannot exist without the other. Using the letters provided, identify one composite relationship from the class diagrams provided.

[1]

(d) (i) Explain the term multiplicity.

[2]

(ii) How is multiplicity applied to the relationship labelled C?

[2]

[Turn over





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[Turn over

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24ADV1113

6 Liam, a programmer at SSC, is developing test cases that identify whether correct discounts are applied for landscaping and garden maintenance work.

(a) By referring to **Figure 1: Thompson's Charges** of the case study, complete the partial test table below. Sample figures may be used for total contract costs, where necessary.

Test Data	Reason for Test Data	Expected Outcome
Job Type: One Off Cost: 501	Check 10% deposit applied	10% deposit applied
	Check no deposit applied	No deposit applied
Job Type: Contract Customer Type: Private Total Contract Cost: 2500 Duration (months): 1	Check flag for deposit required Check 5% deposit applied Check no discount applied	
Job Type: Contract Customer Type: Private Total Contract Cost: 2500 Duration (months): 6		
	Check flag for deposit required Check 5% deposit applied Check no discount applied	Customer flagged for 5% deposit 5% deposit applied No discount applied
	Check flag for deposit required Check 5% deposit applied Check 8% discount applied	Customer flagged for 5% deposit 5% deposit applied 8% discount applied

[6]



7 Seamus, a software developer at SSC, is using the sample quotation document below to work through the normalisation process for the new database system at Thompson's Nursery.

Thompson's Nursery		Quotation No:	TL198
		Start Date:	23/03/22
		Duration (Days):	2
Landscaping Quotation (Private Customer)			
Customer No:	194	Staff Assigned	
Name:	Ann Mackie	ID	Name
Address:	27, Bridge Park Upper Newtown Road BT12 3QW	12	Simon Quinn
Telephone No:	0799999999	15	Sally McDade
Email:	am123@gmail.com	17	Jane Gray

Job Details						
Job ID	Description	Material ID	Material Description	QTY	Unit Cost (£)	Total (£)
TLPS	Fix paving stones	PV45	Sandstone Pavers 450 × 450 mm	14	4.78	130.52
		PSLB	Kiln Dried Paving Sand (large)	4	5.15	
		PSSB	MOT Type 1 Sub-base, Bulk Bag	1	43.00	
TLBP	Plant path border	SWG	Winter Gem Boxwood	20	24.99	639.7
		SHO	Hosta	10	7.99	
		SAF	Autumn Fern	10	6.00	
					Total (£):	770.22
					Labour (£):	600.00
					VAT (£):	274.04
					Total Cust Charge (£):	1644.26

He has identified the repeated groups (multiple and nested) and extracted the unnormalised fields, as shown below, that are required to begin the normalisation process.

QuotationNo, StartDate, Duration, CustNo, CustFName, CustSName, CustAdd1, CustAdd2, CustPostCode, CustTel, CustEmail, {StaffID, StaffFName, StaffSName}, {JobID, JobDesc, {MatID, MatDesc, Qty, UnitCost}}, Labour



8 Seamus is also working on the database structure for managing orders and stock.

The diagram below shows a partial database for stock:

CUSTOMER		SALEAREA		STOCK	
Field	Data Type	Field	Data Type	Field	Data Type
CustID	int	SaleAreaID	int	StockID	int
CustForename	varchar(20)	SaleAreaDesc	varchar(20)	StockDescription	varchar(20)
CustSurname	varchar(20)			CostPrice	decimal(5,2)
CustDOB	date			SalePrice	decimal(5,2)
CustAddress1	varchar(30)			QtyInStock	int
CustAddress2	varchar(30)			ReorderLevel	int
CustPostCode	varchar(7)			SaleAreaID	int
CustPhoneNo	varchar(11)			SupplierID	int
RegistrationDate	date				

SUPPLIERSTOCKORDER		SUPPLIER		CUSTOMERORDER	
Field	Data Type	Field	Data Type	Field	Data Type
SupStockOrderID	int	SupplierID	int	OrderID	int
SupplierID	int	SupplierName	varchar(20)	CustID	int
SupStockOrderDate	date	SupplierPhoneNo	varchar(11)	OrderDate	date
EstDeliveryDate	date				
DeliveredYN	char				

CUSTORDERDETAILS		SUPSTOCKORDDetails	
Field	Data Type	Field	Data Type
OrderID	int	SupStockOrderID	int
StockID	int	StockID	int
Qty	int	Qty	int



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For Examiner's use only	
Question Number	Marks
1	
2	
3	
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5	
6	
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8	

Total Marks	
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Examiner Number

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Rewarding Learning
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General Certificate of Education
2023

Software Systems Development

Unit A2 1

Systems Approaches and Database Concepts

Case Study

[ADV11]

THURSDAY 1 JUNE, AFTERNOON

Examination Copy

Instructions to Candidates:

The A2 1 Systems Approaches and Database Concepts examination is based on this pre-release Case Study.

You must use **this** clean copy of the pre-release material in the examination and **not** your own annotated copy.

THOMPSON'S NURSERY

Thompson's Nursery has developed significantly since being taken over by Harry Thompson two years ago. The original nursery focussed entirely on the sale of plants, shrubs, trees and hedging, along with a very basic range of associated horticultural items.

Thompson's is located in several acres of arable land which Harry has started to develop and plant. There is a shop on the site and all the nursery business is conducted there. After a year in business, Harry was granted planning permission to renovate and extend the existing premises. There is now a reasonably well-stocked gift shop and a small café that is almost ready to open.

Since Harry took over the business, supplies include a wider range of plants, seeds, vegetables, bedding-plants, shrubs and trees. These are planted and tended throughout the site by a team of six full-time gardeners.

At present, Harry is in the process of developing a wholesale aspect and on-line sales to the business as well.

He has already agreed several contracts for the supply of stock to retail outlets. This has brought a whole new dimension to the business and has created some administrative problems that he did not foresee, particularly with ordering stock.

Thompson's also provides landscaping and garden maintenance services to the public and to local companies. These services are very much in demand, and it is very difficult to anticipate the staff allocation necessary to support them. In addition, there are increasing demands on staff because of wholesale supply and distribution.

Harry has recently employed five additional part-time gardening staff and a secretary, Ellen Holmes. He has also appointed Ted Hughes, as head gardener, to help manage the gardening staff. Harry likes to do everything himself and insists that Ted must agree all decisions with him. This is causing problems as Harry is seldom available and delays are inevitable.

Harry considers himself proficient in IT and believes he can manage this side of the enterprise himself. When he took over, he had a basic point of sale system installed, however, he did not take proper advice on this installation. Unfortunately, he bought a 'budget' system that was set up with little or no consideration given to the real needs of an expanding business. Harry did not fully investigate the extensive range of available options. His limited knowledge meant that he did not fully consider security, fees involved, scalability, proper reporting and the likely support he might need. He is reluctantly beginning to understand that the business is not running as efficiently as it might.

Harry is at risk of progressing too quickly with his ideas. He has underestimated his expenditure and has already borrowed money from the bank to finance his new planting development. Apart from the cost of the stock involved, he did not adequately factor in the cost of the labour involved in the planting and on-going maintenance of the site. Additional staff costs incurred in all areas of the business are becoming a major strain on cash flow.

Landscaping and Garden Maintenance

Harry always takes on jobs as they arise. To do this, he reassigns staff from other areas to cover the work. He prices the job and creates a customer quotation. If the price is agreed, he makes arrangements for when the job can be done. Sometimes he does not give sufficient thought to the materials and stock required for a job. He frequently specifies the time a job is likely to take incorrectly and never factors in any risks such as staff or stock being unavailable. This is an unrealistic approach and causes a lot of customer annoyance. Staff are never sure where they will be sent next. He knows he must find some way of properly scheduling his staff.

Harry has gathered quite a few private customers who want their gardens tended on a regular basis. He has set up basic contracts for these customers. He has also established contracts with some local companies and organisations, to maintain their grounds throughout the year.

Landscaping and garden maintenance services are either one-off jobs or regular contract agreements. Customers pay a 10% deposit for one-off landscaping and garden maintenance jobs if the total cost is more than £500. The outstanding balance is payable on completion.

Alternatively, contracts are set up for specific time periods. For private customers, these can be for one month, three months (notably the summer months) or for six months (spring and summer months). Occasionally, a customer will want their garden maintained on a one-year contract. Contracts for companies and organisations are for three months, six months, twelve months or for a two-year period.

All contract customers must pay an initial deposit of 5% of the total contract cost. Harry also offers contract discount incentives as shown in the Thompson's Charges table below:

Figure 1: Thompson's Charges

ONE OFF JOB	Cost	≤ £500	> £500			
	Deposit	0%	10%			
CONTRACT CUSTOMERS						
Private	Deposit 5%	No. of months				
		1	3	6	12	
	discount	0%	2%	5%	8%	
Company/ Organisation	Deposit 5%	No. of months				
			3 months	6 months	12 months	24 months
	discount		0%	5%	8%	10%

Contract customers pay in a variety of ways including annual, monthly, or weekly payments (generally private customers). Customers wanting to renew or terminate contracts must give at least four weeks notice.

The landscaping and garden maintenance services are becoming very well established, but the administration involved is immense. Because Harry has not got a proper system for managing these services, things are getting out of control. His scheduling system is chaotic and there are frequent double bookings resulting in jobs not starting on time. Sometimes Harry will take his staff off one job to start another in order to appear to be on target. This inevitably leaves the first customer annoyed because work is unfinished and the agreed time scale has slipped. Increasingly customers have to wait for quotations because Harry is so busy.

Harry records all jobs in a diary. He notes the date the job is to start, the customer details and the cost and deposit along with anything else he considers relevant. He continually makes mistakes: sometimes he records the date that the service is requested rather than the date it is to be started; or he does not note the proper cost because he has to go out to the customer to actually see what is involved first. This is becoming increasingly difficult as the customer base grows. He hopes that Ellen will be able to unravel some of the paperwork.

Gift Shop

The gift shop is managed by Linda Dobson and Anne White. It is very popular with the public, but Linda and Anne are really stretched to capacity. At peak times, Harry will take on some temporary help, but it is haphazard and if either member of staff is unable to come to work, real problems arise. Recently, Harry has had to step in on occasions to help in the shop because Linda and Anne are struggling. He has now seen at first hand some of the many problems that exist. When the café opens this could be even more problematic.

Although sales are recorded on the system in the shop for gift items and ordinary nursery plant sales, there is no proper stock control aspect to the current system. There is no warning for low level stock, so items can become unavailable very quickly. There is no sales analysis at all. Staff are unable to tell customers exactly what stock is available. Updating prices on the point of sale system has to be done externally, which can take up to two days.

Every Monday a manual stock check is conducted in the shop and items are put on order forms for Harry to agree. This same stock checking process is done in the nursery gardens and the gardeners will tell the shop staff what must be ordered. These requests are communicated verbally and unless they are recorded immediately there is a real danger that Linda and Anne may forget, and the items will not be ordered.

When ordered items are received, they are manually checked off against the orders made and discrepancies should be noted. Linda and Anne are supposed to record any issues in a notebook kept beside the till. Sometimes this does not happen because they are busy, and this results in unrecorded short-falls in stock which may be paid for by accident. At other times, because Linda and Anne are familiar with some of the suppliers, they will make a phone call to note the problem. However, no paperwork is done to audit these events and with more and more stock, problems are escalating.

Harry recognises that he is in danger of both over and under stocking in every area of his business.

Wholesale

Harry deals with the wholesale side of the business exclusively. He lacks any proper procedures and has ended up with a rather messy approach to orders and billing. There is no formal ordering process from retailers. When he first started the wholesale aspect of the business, he had only two retailers and there was no real issue. He agreed prices verbally with them and supplied the items accordingly. This was acceptable at the beginning but because he now has around thirty retailers to supply, things have got out of hand.

Harry accepts orders over the phone or when someone calls in to the nursery. He writes requirements down or maybe makes a note on his phone. Ordering and invoicing are becoming major problems. Orders from retailers can be overlooked or incorrectly recorded. He has had a lot of complaints in the last month. At one point he was unable to supply a sufficient range of bedding plants for retailers. This was a result of poor planning in terms of his planting schedule and also his failure to staff the growing operation adequately.

Conclusion

Harry's accountant has advised him to slow down and to take some professional advice regarding the installation of proper IT systems. He has pointed out to Harry that he is not managing any stock properly at all. This includes stock for the nursery, the shop, gardening implements, landscaping and maintenance materials and all his other horticultural supplies. With the café opening, further problems are likely to arise.

Harry has discussed the problems with his accountant and with his senior staff. He realises that he urgently needs to investigate proper computer solutions for the business. He has met with representatives from the Software Solutions Consultancy (SSC). They are going to review the entire business and make recommendations for the implementation of a new computer system.

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