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Rope Ltd is a family run business, which supplies hemp and synthetic ropes to mountaineers, boat owners and shipping companies around the world. They source the hemp and other materials from a number of suppliers based in many countries. They distribute their products to retail shops as well as to industrial shipping firms and boat builders, as well as general camping and outdoor shops. Their mission statement is "We supply them, you knot them", and they have been in business for over 100 years.

Question 1

(a) The Rope Ltd systems to date have focused on day-to-day operations, and the firm would like to have recommendations for systems to help with planning. What types of general IT systems would you suggest, and why? (8)

I would suggest integrating an Enterprise Resource Planning solution to help with the planning of day to day operations. Enterprise Resource Planning typically involves many software packages that work together, such as

- Supply Chain Management, for automated stock replenishment and control (getting the correct fibres for ropes, or supplying their clients with the right amounts of stock)
- Transaction Processing System, for processing large volumes of sales data
- Decision support systems which help management analyse key information and make decisions. Can show up hidden trends, such as where the profit comes from in this case, the B2B transactions from the shipping firms/boat builders, or the shops.
- Customer Relationship Management system, to establish relationships with best customers and target products to them, and using analytical tools such as Data Mining to discover which ropes sell when and why.

In order to use an ERP system, Rope Ltd must set out clear goals, and develop a strategy in order to achieve these goals.

(b)The website for the company supports mainly consumers, and not businesses that are shopping for rope.

i. Explain why business-to-consumer shopping is more easily supported on their website, than business-to-business shopping. (5)

Business to consumer shopping is easier to support on a website as consumers do not mind going through a slightly different order of operations to get the product that they are searching for. They also typically only purchase small orders which may vary greatly, eg a customer may want a few mountaineering ropes one week and a guy rope for a tent the next.

Business to Business shopping is harder to implement as each business would prefer a standardized way of integrating the ordering process. Businesses also tend to make large, repeated orders which may be difficult for the website to handle. Large amounts of money may need to be handled. An industrial shipping firm may require 1000 ropes, but does not want to have to search on the website for this each time, and put their credit card details in each time.

ii. Explain what changes you would make to support business-to-business shopping on the Rope site. (4)

The rope site will have to change its emphasis and internal procedures to look towards supporting long term business operations.

- Show prices with with/without VAT
- Support for remembering repeat orders
- Bulk discounts
- Dedicated accounts for clients, with stored information on shipping locations etc.
- Have the site automatically communicate with warehouse/backend to deal with large orders fast (XML etc).

(c)Rope Ltd would also like to integrate their suppliers and distributors more fully into their systems. Explain how and why ebXML or web services could be integrated into Rope's systems. (8)

ebXML and web services provide a means for organizations external to Rope Ltd to find out more about their products, their stock levels, and integrate their processes together to create a long lasting business relationship.

An example of this is the Amazon Light website, which uses Amazon's web services to provide an alternative to Amazon's web store. This is profitable for both parties, Amazon still make money from sales, and Amazon light make money from advertising.

Web Services could be integrated into Rope Ltd's stock and ordering systems, so that resellers such as the camping and outdoor shops can resell their products through their own E-stores. When a customer is browsing products on the camping stores website, the camping stores website can be showing live information from Rope Ltd's system, and can get products from Rope Ltd's warehouses without first having to go to a warehouse for the resellers online store. In this fashion, other resellers can instantly start selling Rope Ltd's products, without having to deal with the product themselves, merely the payment.

ebXML can be used by the Industrial Shipping and Boat Builders to automatically order new products as they need them, and to seamlessly integrate their own stock systems into Rope Ltd's, creating a robust and efficient supply chain.

Question 2

(a) Recently the Rope Ltd databases have become a bit of a mess. Sometimes new databases are added for each software project, but more often they adapt old ones, and add new tables as required. You've been brought in to sort them out. Explain what your guiding principles would be and what steps you'd take to sort out the databases used by the firm. (8)

(NOTE: This answer is a guess!)

In solving this type of problem, an entirely new set of databases needs to be designed, using a common data model. This model will set out a firm wide description of the objects and concepts used throughout the firm, which allows the building of common applications for the firm, and enables the construction of reusable components.

The steps to be taken

- Integrate each department's stovepipes together, to pipe the data about the firm. This enables common data to be stored on one place (eg the types of fibre used to make a rope) where it can be reused by any dept that needs it (Warehouse, Manufacturing, Stock Ordering Systems, Employee Training)
- Use appropriate software engineering techniques
- Capture the requirements of each project
- Write the specification
- Go back to user scenarios
- Check the workflow of business processes

Work with the client at all times, and keep referring back to them any changes that are made and clarify exactly what they are trying to achieve.

(b) The current customer-facing version of the Rope website was done by someone who left the site in the prototype stage of development. It was done by someone in-house with the firm, who was moved to a new project and has not been able to return to 'finish' the site.

i) Explain what this might mean, and what the implications are for the website and its future development. (8)

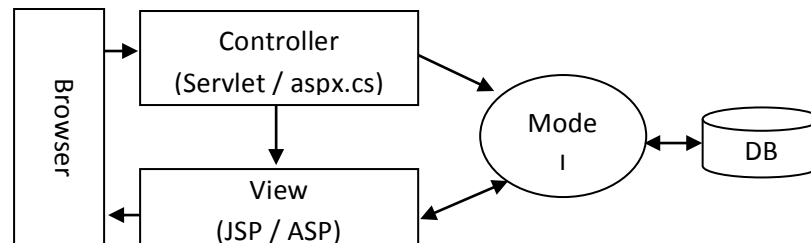
If the website is left in a prototype stage, this typically means that a few pages will be functionally operational, and it may only be providing a conceptual model of what the actual site will look like.

In the prototype, little thought will have been given to the underlying architecture of the web application, or the integration of the various components of the website. There will likely be a mix of scripting languages and raw HTML in pages, and a knock on effect of this is that there will be little reuse of code between the pages.

Before the website can be moved beyond the prototype stage, an architectural pattern must be chosen.

The architectural pattern most suited to web development is Model View Controller.

The aim of this architectural pattern is to isolate business logic from the user interface considerations, resulting in application where it is easy to change the visual appearance or controlling logic without affecting the other. The Model represents the data used by the application, the controller is the underlying business logic and the view is the presentation of information to the user.



By doing this, Ropes Ltd will create a web application which is easy to design, easy to alter and also is easy to add functionality to.

ii)

```
<%! float addShipping(Float price) {
    price = price+4.5;
    return price;
} %>
<p>Price with shipping is: <%=addShipping(price) %> </p>
```

Using the code above from a prototype JSP page: (9 marks total for a) b) and c))

a) Explain what the code does (3?)

The code defines a method, which adds a fixed shipping cost to the price, which is a parameter passed to it. The method is called, and the result is outputted to the user.

b) Explain why it would not work in its current state when the site moved beyond its prototype stage (3?)

The code defined is in a JSP page. This means that the method can only be called from this page, and as this method is going to need to be called for each order, leaving it here would involve copying and pasting it into every page, which is not a good idea.

c) How it would be done differently in the new version (3?)

The method would be placed in a “Bean” class that represents an order. The controller of the web application (Servlet) will invoke the instantiation of an order object (the Model), and the result of the calculation will be passed by the bean to the View (JSP).

Question 3

Rope Ltd human resources staff feel that they spend too much time working on 'basic updating' duties fixing the spelling of people's names in their files, and changing their mobile numbers when someone gets a new mobile, or moves house. They think this should be part of the plan for the rollout of the company-wide enterprise system that's due later this year.

(a) Having employees do some of their own admin work as described above means that the human resources staff can focus on other more important aspects of their job. Together with linking the employee records to a web interface, which the employees can edit themselves, involves the use of an important enterprise level IT concept. Explain what the concept is and how it will benefit Rope Ltd. (9)

The concept is an employee/HR management system, which will be incorporated as part of an Enterprise Resource Planning (ERP) system.

This HR system will have a frontend (either as an app or a web portal) for employees to manage their details, and the data will be stored centrally.

This data can then be piped all round the ERP system, and can be accessed in all relevant parts of Rope Ltd.

Access rights can be granted on this information to make sure that only the right people can see the data.

This benefits Rope Ltd as there is no replication of data, so storage can be smaller. There is also one main place that needs to be backed up, greatly simplifying this task.

Allowing employees to manage their data is the best way of ensuring that it is up to date and correct, freeing up resources which are traditionally used paying people to update data.

(b) In the old system the details for the employees are taken from one system and used in another. Ideally in the new system it would be useful if there was a way to retrieve this automatically from the main system as the human resources department need it, so that the two systems could be integrated. Describe what enterprise issues would need to be considered, and explain why they are important in this context. State any assumptions that you make. (9)

Use of a common data model between the two systems is essential.

If two different data models are used by each system, errors could occur when translating data from one system to the other.

The integrity of the data must not be compromised, as this not only will cause severe inconvenience to all concerned, but there are legal connotations here as well.

By using a common data model, the same information about an employee is modelled in both systems to minimize the chance of this occurring.

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As with all distributed database systems, the lost update problem can occur if a member of staff in one department changes data, but a member of staff in other also changes the data at the same time.

Access rights will also be a problem, some data may be required by one department, but they may not have global access to it, causing errors in the system.

(c) As staff make changes to their records the updates are recorded in a database for the human resources staff to monitor and catch any obvious errors, such re-entering their old address instead of the new one, and other typos. Staff receive these updates as part of an XML (RSS) feed, which is automatically generated from edits to the staff profiles. Explain whether the generating of this feed should be done with done with DOM or SAX and why. (7)

The generating of the feed should be done with SAX.

SAX

- Is lightweight
- Is fast
- Writes line by line
- Doesn't hold a model in memory
- Write forwards

DOM

- Builds up a comprehensive model before any generating
- Is much more complex
- Can perform simultaneous parses
- Can write in any direction

SAX should be used as there is no parsing being done. Therefore the powerful model generated by DOM is unnecessary. SAX operates 4 times faster than DOM, and that is likely to be the most important feature that Ropes Ltd require.

Question 4

Rope Ltd is in the process of integrating its systems with their suppliers, distributors, and large customers so that everything is done with XML. Orders come in from distributors and retailers as XML documents.

(a) Explain the benefits to Rope Ltd of having both their supply chain and their customer base using XML documents for ordering and dispatch of their ropes. (8)

- Common format from both supply chain and customer base to the orders department
- Easy to integrate systems together this way
- XML is platform independent, so no hardware constraints at each end
- One parser needs to be written for all systems
- Automation easy with XML
- Can be integrated into a SCM meaning stock can also be replenished automatically

b) Part of the application that will process the XML documents has this code in it. Explain what the code does, where it is likely to be found, and why it will be useful in the application.

```
public void StartElement(string namespaceURI, string sName, string qName,
    Hashtable attrs)
    {
        string eName = sName;
        Emit(" " + sName + " ");
        if ("".Equals(eName)) eName = qName;
        stack.Push(eName);
        value = new StringBuilder();
    }
```

(9)

What the code does:

Retrieves a value for the specified element.

Where its likely to be found:

It's reading values from an XML file and placing the contents in memory. So it's from a parser. As it is dealing with Elements and not nodes, it's from a SAX parser

Uses

XML parsers are extremely useful. An xml source file can be transferred to a system, and this is read into the parser. Meaningful data can be extracted from the file, as the parser looks for the tags. This can then be read into memory for further processing.

c) Rope Ltd has heard about CRM systems, but is not sure that this would be the best option for them. Explain whether you think a CRM system would be good for the firm. As part of your answer

explain any potential problems that might be encountered, and what benefits it would bring to the firm. (8)

CRM is good because

- Helps retain customers. 100 loyal customers are far more profitable than 4000 one off customers.
- Can employ Data warehousing to gather large amounts of data about customers
- Can use data mining/OLAP to examine the data warehouse to deduce trends in the market, and can market more effectively
- Helps to get to know the demographics of the customers. New products can be created to appeal to them

Problems with CRM

- Large volumes of data from warehousing can be difficult to store and process
- CRM deals with customers only
- CRM can be messy if it is not implemented carefully