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# Answers

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- 1 (a) This question asks candidates to analyse the business analysis certification training industry (BACTI) in Erewhon using Porter's five forces framework. This is the preferred approach of Xenon, the company commissioned to undertake the study. In this context it seems a reasonable model to use. The forces ultimately determine the profit potential of the industry and ABCL will be keen to invest in an industry where there is long-term return on its investment. The framework also helps identify how a potential new entrant (such as ABCL) might position itself in the industry. The five forces driving industry competition are the threat of entrants, the threat of substitute products or services, the bargaining power of suppliers, the bargaining power of buyers and the competitive rivalry between existing firms in the industry. Looking at each of these in turn:

#### The threat of entry

New entrants to an industry bring new capacity. Existing suppliers stand to lose market share and have their profitability eroded. In the context of ABCL, the threat of entry is a particularly significant issue because they are, themselves, threatening to enter the industry. Consequently they need to understand the barriers to entry to see if they are sufficient to deter or delay their potential entrance. Furthermore, an understanding of these barriers will give them an understanding of how likely it is that other companies will consider entering the industry. If barriers are high then the threat of entry is low.

In the context of the scenario, the main barriers appear to be:

- Access to supply channels. The industry is dominated by three established providers who know the industry very well and have established relationships with key suppliers of expertise; the lecturing staff. In two instances, CATalyst and Batrain, lecturers are full-time employees with attractive salary packages, share options and generous benefits. In the case of Ecoba Ltd, the company promotes the images and expertise of the high-profile presenters that it uses. Although these presenters are on sub-contract, they feel secure about the arrangement. As one of them commented 'students are attracted to the company because they know I will be teaching a certain module. I suppose I could be substituted by a cheaper resource, but the students would soon complain that they had been misled.'
- The fees of 60% of all students are paid for by their employer. The three established suppliers have good relationships with the major corporate customers and, in some cases, have set up infrastructure (dedicated training sessions, personalised websites) to support these contracts. Although corporate customers do switch provider (see later), it might be difficult, in the short term, for ABCL to gain corporate clients.
- Expected retaliation is an accepted barrier to entry. The industry in Erewhon has a history of vigorous retaliation to entrants. The scenario mentions that ABCL has commissioned the study from Xenon because of the well documented experience of another Arcadian company, Megatrain. Megatrain's proposed entry into this market place was met by price-cutting and promotional campaigns from the established suppliers. This was supported by a campaign to discredit the CEO of Megatrain and to highlight its foreign ownership. Porter makes the point that there is a strong likelihood of retaliation where there are established firms with great commitment to the industry and who are relatively illiquid. This is supported by evidence from Ecoba's balance sheet where goodwill and property are both significant assets.
- The cost and time taken to achieve gold level certification may also deter ABCL from entering the industry. All three main providers currently have EloBA's gold standard. To be a creditable alternative, ABCL has to achieve this level of certification. Evidence from the case study suggests that it takes at least one year to achieve this certification. In the meantime ABCL will be trading at a disadvantage.
- The three providers dominating the industry have well-established brands, supported by extensive marketing. ABCL will have to invest heavily to overcome existing customer loyalties and to build up a brand that appears to be a credible player in the industry. This will require time, and investment in building a brand name is particularly risky since, as Porter explicitly recognised 'it has no salvage value if entry fails'. However, there are only 15 major corporate customers. ABCL could target these to gain market share. It is possible that ABCL already works with these customers in Arcadia, and they may also be attracted by ABCL's e-learning expertise.

#### Threat of substitutes

The threat of substitutes is again important to ABCL because it would not want to invest in an industry where the product or service is under threat. Substitution reduces demand and might, in extreme cases, lead to the product or service becoming obsolete.

The threat of substitutes appears to be constant in this industry. There is no legislative or certification requirement to study for the examinations with an accredited provider. Evidence from the case study suggests that a large proportion of students do not attend formal classes but prefer to study on their own.

The case study also mentions that one of the smaller providers has gained some success by providing 'blended' learning solutions where tutors provide some support, but students are expected to complete e-learning modules. In effect, these students are substituting face-to-face tuition with e-learning. The case study scenario mentions that the three established providers, whilst acknowledging the possibilities of e-learning, are retaining their classroom-based model. Not only is it profitable, but it allows the companies to employ their investments in specially-designed classrooms, buildings and staff.

ABCL might consider the threat of substitutes as a business opportunity. They do have expertise in providing e-learning materials and it might be a way of entering the market place with products that are significantly differentiated from their competitors.

### **Bargaining power of buyers**

The power of buyers concerns the ability of buyers to force down prices, bargaining for higher quality or more services by playing providers off against each other. In the scenario it appears that:

- (1) The power of the corporate buyers is relatively high. The scenario mentions that 60% of all students are paid for by their employer. There is a history of these corporate buyers regularly changing providers to gain better prices. For example, the scenario states that a large insurance company had recently placed all its training with Ecoba after several years of using CATalyst as its sole provider.
- (2) The cost of switching providers is relatively low. This applies to both corporate buyers and individual students.
- (3) In general, the products purchased are standard and undifferentiated. The three main providers all deliver training through face-to-face classroom training. Buyers are always sure that they can find alternative providers.
- (4) There is some threat of the supplier (provider) being bought by a buyer (customer). The case study scenario provides an example where WAC, a major supplier of business analysis consultancy services, has itself bought one of the smaller providers and now delivers all of its business analysis training in-house. Hence there is a credible threat of backward integration.

All of the above suggest that the bargaining power of buyers is high in this industry.

### **Bargaining power of suppliers**

Suppliers exert bargaining powers by threatening to raise prices or reduce the quality of their services. The conditions that make suppliers powerful tend to mirror those that make a buyer powerful. Very few of the conditions that would lead to high supplier (provider) power appear to exist in the case study scenario. The only circumstances that might apply are:

- The supplier (provider) industry is dominated by a few companies and is certainly more concentrated than the industries it sells to. Suppliers selling to more fragmented buyers will normally be able to influence prices, acceptable quality and supply terms.
- Porter also recognises that labour is a supplier. The case study scenario suggests that it is difficult to find competent, committed lecturing staff. This, of course, poses another problem for the providers. Lecturers on flexible contracts can threaten to either move to work with competitors or set up their own business to compete in the market.

### **Competitive rivalry between existing firms**

The rivalry amongst existing firms needs to be understood. Are rivals bitter and aggressive or do they appear to exhibit a large degree of mutual tolerance? In the case study scenario the three companies that dominate the industry seem to co-exist on relatively good terms and indeed appeared to co-operate to provide a co-ordinated response to Megatrains' potential entry into the industry. They also appear to tolerate the existence of a relatively large number of smaller providers. Industry growth is still strong and this means that firms can expand and improve their performance by just keeping up with industry growth.

However, the products are relatively undifferentiated, particularly once gold level certification has been achieved. They are all providing training services for certification examinations using classroom-based tuition. As already recognised there is little to stop customers switching between competitors, and this will increase competitive rivalry.

The preoccupation of the three main providers seems to be the protection of their marketplace from large new entrants. Hence ABCL can expect a vigorous response to their proposed entry into the industry.

## **(b) Report Title:** An evaluation of the attractiveness of Ecoba Ltd as an acquisition target for ABCL

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**Date:** March 2009

### **Executive Summary**

In January 2009, Xenon Ltd (referred to from this point as we or us) produced an interim report analysing the business analysis certification training industry (BACTI) in Erewhon. As a result of this report, ABCL asked us to evaluate the attractiveness of Ecoba Ltd as an acquisition target. This report examines the ownership, business model and performance of the three main suppliers in the industry. Ecoba Ltd has a dominant shareholder who is approaching retirement and so is likely to be amenable to realising her investment in the company. In contrast, the other two main suppliers have relatively complex ownership structures which, in our experience, lead to immediate rebuttal or protracted negotiation. Ecoba's business model currently minimises training and administrative overheads and could be retained or, in the longer term, remodelled to reflect the operating preferences of the acquiring company. Ecoba's financial performance is acceptable. It is not as profitable as its competitors, but it is very lightly geared, while other ratios are roughly in line with industry competitors. Our conclusion is that Ecoba Ltd is a viable and attractive acquisition proposition for ABCL.

### **Introduction:**

In January 2009, Xenon Ltd (referred to from this point as we) produced an interim report analysing the business analysis certification training industry (BACTI) in Erewhon. As a result of this report, ABCL asked us to evaluate the attractiveness of Ecoba Ltd as an acquisition target. This report examines the ownership, business model and performance of the three main suppliers in the industry. This short report analyses the current operational and financial position of Ecoba. It also explains why we believe that Ecoba is, between the three main suppliers in the industry, the most appropriate target for acquisition.

### **Analysis:**

Ecoba is a private limited company, almost wholly owned by its founder Gillian Vari. It is the smallest of the three providers that dominate the BACTI marketplace. CATalyst is a wholly owned subsidiary of the Tuition Group, a training and education

provider quoted on the Erehwon stock market. In their latest annual report, Tuition Group identified CATalyst as core to their strategy and a source of significant growth. We do not believe that they would be interested in selling CATalyst, except at a premium price. Batrain is a private limited company, with shares equally divided between the eight founding directors. Given this share distribution, and the age profile of the directors, we feel that it is likely that any proposed acquisition of Batrain would either be immediately rebuffed or it would lead to a complex and drawn out negotiation given the number of stakeholders involved. In contrast, Gillian Vari is approaching retirement. She holds 95% of Ecoba's shares and we feel that she might be amenable to realising her investment in Ecoba.

Ecoba itself does not employ any full-time teaching staff (except Gillian herself). Their strategy is to employ well-known industry 'names' on sub-contract and to publicise these names in their advertisements, website and other publicity. They also publish the name of the lecturer on their class timetables. Gillian is averse to employing full-time lecturing staff because 'they have to be paid if courses do not run and during the long vacations'. It is perhaps this reliance on sub-contract staff that leads to the cost of sales running at about 80% of revenue. This figure is significantly higher than their two main competitors (65% and 63%) and this needs further investigation. We suspect that the competitors classify full-time staff as overheads (rather than cost of sales) but we need to investigate this.

Overall, sub-contract lecturers appear quite happy with this arrangement as they believe that there is little chance of being replaced by lesser 'names' or, as happens at the other two companies, by full-time staff at too short notice to arrange alternative work bookings. However, they do complain about how long it takes Ecoba to pay their invoices. This is supported by the financial data. The average payables settlement period is 144 days in 2008, up from 130 days in 2007. Comparing these with the two rivals suggests that this is not the industry norm. It will be important, in the short-term at least, to retain these lecturers. Any concerns they might have about working for new management might be partly offset by the goodwill generated by paying their invoices much more quickly.

The inefficiency that leads to a high number of settlement days for payables is also reflected in the average receivables settlement days. In 2008 this was up to 71 days, compared to 64 days the previous year. Again, comparisons suggest that this is not the norm for the industry. Gillian has always been careful to keep administrative overheads relatively low. However, this suggests that they are finding it increasingly difficult to manage the payment of suppliers and the chasing of customer payments. Increased efficiencies in this area appear to be on offer to any company that acquires Ecoba. The sales revenue to capital employed (another efficiency or activity ratio) has increased from 3.16 to 3.76 in the past year. This improvement now means that it outperforms its rivals (3.36 and 3.19).

Before considering any further financial ratios, the extracted financial information suggests the following:

- Significant increases in trade payables (40%) and trade receivables (43%)
- Significant rise in revenue (almost 30% from 2007 to 2008)
- Significant rise in cash and cash equivalents (40%)
- Increase in retained earnings
- Increase in valuation of intangible assets. This would need investigation

Ecoba is not as profitable as its two main rivals. Gross profit is much lower (at about 20%, compared with 35% and 37%) although this probably reflects the large scale employment of sub-contract staff. Net profit is also lower, but not substantially so (at 4.55%, compared with 6% and 8%). However, all profitability ratios at Ecoba (ROCE, gross profit margin and net profit margin) showed slight improvements in 2008 compared with 2007.

Liquidity at Ecoba appears to be relatively stable. Inventories are relatively low in this industry and so the current and the acid test ratios are almost exactly the same. Although the absolute value of these ratios is relatively low (0.91 – 0.93), similar figures are returned by their competitors and so there does not seem to be any particular cause for concern.

Ecoba is very lightly geared, with gearing ratios much lower than their competitors. In 2007 the gearing ratio was 4.2% with an interest cover ratio of 37.5 times. This had reduced in 2008 to 3.8% and the interest cover ratio had increased to 50.

### Conclusion

The picture that emerges is of a company that is relatively risk averse. This is reflected in their employment of sub-contract lecturing staff rather than full-time staff (allowing Gillian to balance supply with demand) and the minimisation of overhead administrative staffing costs. This latter appears to have been a false economy as it has led to poor credit control and complaints from suppliers about late payment. Financial gearing is very low and any buyer of the company has the opportunity to use the company's unused borrowing capacity. Gillian has also been prepared to live with lower profitability figures than her rivals and this may be a reflection of the fact that she has fewer shareholders to consider.

Any company that acquires Ecoba gets a company where changes can be quickly made to improve efficiency. We suggest that Gillian's business model should be retained in the short term, but in the long term it would be possible to change the model to potentially improve profitability. In conclusion, we believe that acquiring Ecoba will provide ABCL with a cost-effective entry into the BACTI market in Erehwon.

- (c) Transfer in ownership of a company creates anxieties amongst customers, suppliers and employees. ABCL are right to consider stakeholder management during this transition, particularly now that Gillian Vari has left the company. However, there is insufficient time to manage everyone to the same degree. Also, it is not necessary. There may be stakeholders who are indifferent to the change and involving them may be difficult to achieve, unsettling and time-consuming.

Stakeholder analysis usually involves some mapping of power against interest. This can be used to determine how they should be managed. The following represent the most likely stakeholders that the management of ABCL will need to manage. The suggested categorisation is arguable, so students do not have to agree completely with this analysis to gain the marks on offer.

*Corporate customers:* the scenario mentions that two corporate customers have recently switched their training contracts to Ecoba. They may be unsettled by the change, particularly as the person who negotiated those contracts (Gillian Vari) has now left the company. One of the customers specifically changed provider because they were impressed by the 'named' lecturers that Ecoba could provide. They would need to be reassured that these lecturers will remain under new ownership. In stakeholder mapping terms it could be argued that corporate customers have high power (because they can move their contracts elsewhere) and high interest. It is advisable for ABCL to actively manage these key players during the transition period, perhaps by appointing account managers with specific responsibility for each corporate customer.

*Lecturers:* these are the named 'suppliers' on contract to Ecoba. It is likely that these stakeholders will be anxious about the acquisition as they know that the two main competitors employ full-time lecturers. ABCL also employ full-time tutors in its operations in Arcadia. Lecturers will be worried that the business model of Ecoba will be changed by the new management. On the other hand, Ecoba will, at least in the short term, wish to retain these names to allow business continuity and to fulfil the expectations of at least one corporate client. This group of stakeholders might be classified as having high power (because they can work for established competitors) and some interest. A reasonable stakeholder strategy might be to keep these lecturers satisfied. An early move to prompt invoice payment may help keep them onside.

*Full-time administrative staff employed by Ecoba.* There is evidence in the case study scenario that administration is under pressure and this will have to be investigated. Failure to pay suppliers on time or chase up debts might be due to time pressure or incompetence. In stakeholder management terms this group can probably be defined as having high interest but very little power. They are best managed by keeping them informed about proposed changes. At most, they should be kept onside.

*Individual students.* This is a large, diverse group. As customers they are focused on passing examinations. Individually, they have relatively low power, and, in the context of the transition, they probably have very little interest. The size and diversity of the group make it difficult to agree a stakeholder management strategy. There could be an argument for ignoring this group completely. As long as lecturers and, to some extent, administrative staff, are properly managed then this group should see little tangible change. Minimal effort should be put into managing individual students.

*EloBA.* The EloBA run the certification scheme. They will wish to be assured that ABCL will maintain the standards achieved by Ecoba. The EloBA is a powerful stakeholder as it could potentially withdraw accreditation. Hence it has high power. It is difficult to gauge its interest as the scenario gives little information about it. However, at worst it should be kept satisfied throughout the transition process, so that it does not become excessively interested and hence a key player in the success of the transition.

- 2 (a) IL supplies both manufactured products (crutches, walking frames) and bought-in products (mobility scooters, bath lifts). The value chain for these two sets of products is different and this is reflected in the following analysis.

The primary activities of the value chain are:

**Inbound Logistics.**

These are activities associated with receiving, storing and disseminating inputs to the product. Typical examples are materials handling, warehousing and inventory (stock) control.

For manufactured products this concerns collection of material from scrap merchants and the storage of that material prior to use. For bought-in products, inbound logistics is handled by the supplying manufacturers. Products are stored in the warehouse.

**Operations**

This is concerned with transforming inputs into the final product. This includes machining, assembly, testing and packaging. In the context of manufactured products this covers the production of crutches and walkers (and other simple aids), their testing and packaging. For bought-in products, operations is concerned with the careful opening of packaging, the addition of an IL transfer logo, the testing of the equipment and the re-packaging of the product into its original packaging.

**Outbound logistics**

These are activities associated with storing and then physically distributing the product to buyers. Finished goods warehousing, order processing and delivery is considered here.

At IL, both manufactured and bought-in products need to be stored prior to delivery. Distribution is undertaken by a national courier company. Orders are placed by telephone or through the website.

**Marketing and Sales**

These are activities by which customers can learn of the existence of and then purchase the products. It includes advertising, promotion, sales and pricing. At IL this covers leaflets in hospitals and surgeries, a website catalogue and order taking and the giving of advice.

**Service**

These are activities associated with providing a service to enhance or maintain the value of the product. It includes installation, repair, training, parts supply and product adjustment. The simple nature of the manufactured products means that service is inappropriate. For bought-in product, service is undertaken by the original manufacturer.

- (b) The value chain is used as a basis for answering the question. Many of the potential re-structuring suggestions produce cost reductions. However, it must be acknowledged that the charity also has the objective of providing jobs for severely disabled

people. Suggestions for change have to reflect this fact. It is also clear from the scenario that some customers are prepared to pay price premiums for the goods by making donations to the charity as part of their purchase of these goods.

#### **Inbound logistics**

For manufactured products, IL could explore the possibility of reducing scrap metal storage costs by requesting dealers to store the metal until it is required. Furthermore, dealers may also be able to offer competitive delivery costs. This would remove the need for IL to maintain (and eventually replace) the lorry it uses for collection of this material. For bought in products, IL could explore the cost of using a specialist logistics company to carry out both its inbound and outbound logistics. This should produce economies of scale leading to reduced costs. Many of these logistics companies also offer storage facilities. However, IL already has storage at an airfield site and the employment of severely disabled labour is one of its objectives.

#### **Operations**

It seems vital that IL retains its manufacturing capability to help achieve its goal of providing work and income for severely disabled people. It could probably gain cost savings by outsourcing manufacture to cheaper countries (like its commercial competitors) but this would not meet its core objective. IL marketing could stress the location of the manufacture as an important differentiator. Customers might then perceive it as an ethical choice.

The operations part of the value chain for bought-in products is relatively labour intensive (see later notes) and could be simplified in two ways.

- (1) Asking manufacturers to affix the IL logo and label prior to despatch to IL. The testing of the products could also be delegated to the manufacturer as they provide post-delivery support.
- (2) Reducing inventory by arranging for bought in goods to be supplied to the customer directly by the manufacturer. Not only would this cut delivery costs but it would also reduce inventory costs, and eliminate the costly write-off of obsolete purchased inventory.

Employees in the warehouse could be reallocated to order processing and other administrative tasks.

#### **Outbound logistics**

The ordering of products through the website appears to be extremely effective. The site includes a product catalogue and a secure payment facility. However, although use of the website is growing, most orders are still placed by telephone. IL might consider ways of encouraging further use of the website, for example by offering discounts, cheaper prices and a wider range of products. It might also consider how it could make its website more available to potential consumers, perhaps by placing dedicated terminals in hospitals and surgeries.

The telephone ordering process is currently too complex because sales staff have to describe the products available and also provide purchasing advice and guidance. IL needs to consider ways of making details of their product range available to customers before they place the order (see below).

#### **Marketing and Sales**

Relatively little sales and marketing takes place at IL which is probably due its charitable status. Charities are usually very keen to minimise their overhead costs. Traditional marketing appears to be very limited, restricted to leaflets in hospitals and surgeries. IL could consider replacing its current leaflets (which just give a phone number and a website) with a leaflet that effectively doubles as a catalogue, showing the products on offer. This should help improve the efficiency of the telephone ordering service. Display advertising in magazines and newspapers with coupons to request a catalogue would also increase the profile of the brand.

Many charities use Customer Relationship Management (CRM) systems to manage their donors. IL should explore the potential of this. It already has records of purchasers and also those purchasers that have made extra donations.

All sales and marketing material needs to stress the charitable status of the organisation. This effectively differentiates it from commercial competitors. There is already evidence that some customers are willing to reflect this by increasing the price they pay for goods by including a donation to support the charity.

#### **Service**

Because of the nature of the product, little direct support is required. However, IL could expand its website to give general support and advice on mobility problems and independent living.

- 3 (a)** The elements of good project management that helped make the branch rationalisation project successful might include:
1. A sponsor (Len Peters) was appointed to own the project. A sponsor is required to make important and decisive decisions about project scope, conduct and approach. In the case study scenario, the precise terms of the voluntary redundancy arrangements were quickly specified. Without a sponsor projects tend to drift and to stall when important decisions have to be made.
  2. The objectives of the project were clearly defined. The target was to cut the number of branch banks by at least 20% and branch employment costs by at least 10%. Quantification makes these specific objectives measurable. It should be clear at the end of the project if the project has successfully met its objectives. Projects that have general objectives, such as 'improve management information' are less focused and more difficult to evaluate.
  3. Constraints were specified at the outset of the project. For example, a time constraint was defined (two years) and an operational constraint (no compulsory staff redundancies) agreed. This latter restriction meant that the project team was

clear at the onset about the scope of the changes they could implement. If constraints are not defined in advance then project teams might suggest inappropriate solutions.

4. An experienced full-time project manager was appointed. The project team was also made up of full-time staff seconded to the project. This meant that they could focus completely on the project and not be distracted by their usual jobs. Part-time secondments to projects rarely work because the team members still have to undertake elements of their day job and the urgency of these often takes precedence over project work.
  5. Potential slippage in the project and its cause was identified and dealt with relatively early in the project's life. This meant that early re-scheduling could be carried out and an extension to the deadline agreed. It helps the management of expectations and helps avoid unexpected last-minute changes in scope.
  6. The project team formally conducted benefits realisation, reporting on the actual performance of the project. This confirmed that the original objectives had been met. A formal post-project meeting was also held to review lessons learnt on the project. This led to a change in estimating assumptions which had led to the original optimistic values. Lessons are learnt on many projects which are not fed back into the project management system. Consequently, another team commits the same mistake or operates under the same false assumption.
- (b) (i) LDB could assess the priority of the three initiatives on the process-strategy matrix suggested by Paul Harmon. The matrix has two axes. The vertical axis is concerned with process complexity and dynamics. At the base of the vertical axis are simple procedures often with simple algorithms while at the top are complex processes which may require negotiation, discussion and complicated design. On the horizontal axis is the strategic value of these processes. Their importance increases from left to right with low value processes concerned with things that must be done but which add little value to products or services. On the extreme right of this axis are high value processes which are very important to success and add significant value to goods and services. From these two axes, Harmon categorises four quadrants and makes suggestions about how processes should be tackled in each quadrant.

*Low strategic importance, low process complexity and dynamics*

This quadrant contains relatively straightforward stable processes which add little business value. They are processes that must be done in the company but add nothing to the company's value proposition. These processes need to be automated in the most efficient way possible. They are often called 'commodity processes' and are suitable for standard software package solutions and/or outsourcing to organisations that specialise in that area.

*Low strategic importance, high process complexity and dynamics*

This quadrant is for relatively complex processes that need to be done but do not add significant value to the company's products or services. They are not at the heart of the company's core competencies. Harmon suggests that these should be outsourced to organisations which have them as their core business.

*High strategic importance, low process complexity and dynamics*

These processes lie in the lower right quadrant of the model. They tend to be relatively straightforward processes which, nevertheless, have a significant role on the organisation's activities. They are central to what the business does. The aim is to automate these, if possible, to gain cost reduction and improve quality and efficiency.

*High strategic importance, high process complexity and dynamics*

Finally, in the top right hand quadrant are high value, complex processes which often include human judgement and expertise and are often very difficult to automate. Harmon suggests that these might be the focus of major process redesign initiatives focusing on business process improvement through the improved performance of the people undertaking those processes.

- (ii) In the context of LDB, the following is suggested. Clearly these are value judgements and credit will be given for coherently argued answers which do not match the examiner's conclusions.
- *The integration of the two bespoke payroll systems currently operated by the two banks into one consolidated payroll system.* Payroll has to be produced but does not add significant value to the end-customer. It is unlikely that the recipients of the system (the bank staff) will notice any difference if a new system is implemented. The bank is considering re-developing this process because of the high cost of updating and maintaining two separate systems. This appears to be of low strategic importance. From the case study it is not clear how complex the payroll requirements are or how difficult it will be to transfer data from the current systems to a new solution. The most obvious approach is to suggest that a standardised software package is bought and data transferred to this solution. It appears sensible to undertake this work using the in-house IT departments who will be familiar with the current systems and so should be able to undertake accurate data mapping and successful data transfer to the new system. However, if this is difficult and time-consuming, there might be some benefit in outsourcing the solution and data transfer problems to a specialist software provider, allowing internal IT to concentrate on more strategic applications.
  - *The updating of all personal computer hardware and software to reflect contemporary technologies and the subsequent maintenance of that hardware.* The bank is perhaps looking for efficiency savings through the standardisation of the desktop. Again, this does not appear to directly give value to the bank's customers. Consequently, this also appears to be of low strategic importance. However, it could be of relatively high complexity, particularly when considering the maintenance of hardware. There seems a clear case for outsourcing this process to a specialist technology company who can bring all hardware and software up to date and then maintain it at that level.

- *The development of processes, systems and software to support private banking.* This appears to be of high strategic importance and high complexity. It delivers services to end-customers who the bank has identified as a source of business growth. Elements of human judgement and interaction will be required when providing this service. The fulfilment of personal requirements for the wealthy customer will bring variety, risk and reward. The development of processes, systems and software to support private banking should have high priority and should be developed in-house. The success of such an operation should deliver handsome profits to LDB. This may mean that, given resources are finite, the development of the new payroll system should be outsourced to a specialist in that functional area.

- 4 (a) Software quality can be defined in terms of its conformance to requirements, reliability, usability and general product characteristics.

**Conformance to requirements**

This is concerned with the software correctly performing the functions defined in the requirements specification. The software must only do what the user requires it to do and nothing else. This is clearly critical in the engine monitoring system. The software needs to correctly monitor the engine and to provide warnings when the engine operates outside defined tolerances. It must not provide false warnings causing the pilot to take action when in fact the engine is running normally. This could be potentially expensive, causing an emergency landing when no such precaution is required. The case study scenario does not suggest that WyAv software has caused any functional failure. However, it does acknowledge that requirements from engine manufacturers are getting less precise. 'Manufacturers are requesting costs and timescales before they themselves have finalised the engine design changes.' This would cause WyAv problems because it makes it difficult to estimate the scope and cost of the software changes. It may also lead to expensive and time-consuming re-work of the software later in the development lifecycle when the engine design changes are finally specified. This will have cost and time implications for WyAv and there may be a temptation to deliver a product on time which is not adequately tested. This increases the risk of functional failure.

**Reliability**

The software must behave consistently and reliably and always be available to provide a service for the user. The reliability of software is usually measured by acceptable levels of availability and downtime. In the engine monitoring system it seems reasonable to assume that the software must be available 100% of the time that the engine is running. No downtime is acceptable as the engine will not be monitored during that period. There is no evidence from the scenario that the WyAv software suffers from reliability problems. However, just as in the case of functionality, the increasing incidence of change requirements being requested before the engine design is finalised, increases the risk of failure.

**Usability**

The ease of use of software is a major issue in software development, particularly when the user has to quickly take safety-critical decisions based on presented data. The scenario provides evidence for this, when a pilot had shutdown the wrong engine due to misreading the information presented in the cockpit. Usability should continue to be an important consideration in the continued enhancement of the engine monitoring system and this appears to be acknowledged by WyAv.

**General product characteristics**

Quality software should show excellence in good build characteristics, such as maintainability, flexibility and expandability. This software quality is about long-term design objectives. In the scenario *reusability* appears to be an important design quality objective. Using proven software components should increase the overall quality of the software. Adherence to *programming standards* is also mentioned in the scenario. This will make the software easier to maintain, particularly if subsequent changes are being made by someone other than the original author. Re-usability and adherence to standards will not only be reflected in delivered functionality and reliability, but also in the long-term maintainability of the software. Evidence from the scenario suggests that WyAv are continuing to employ these practices.

However, quality also reflects the price customers are prepared to pay for it. There is evidence in the case study scenario that price is becoming an issue. One engineer states that 'three years ago nobody queried our prices. Nowadays, with the economic downturn, almost half of our price quotations are queried'. WyAv has to be aware of this as it is in an industry where failure could lead to death. It might have to accept an increased level of risk as a consequence of reducing its prices to remain competitive.

- (b) The V model is a software development lifecycle that explicitly identifies the relationship and link between the development and testing phases with the aim of ensuring that appropriate quality assurance and testing takes place throughout development. The V model has a number of advantages. Firstly, it explicitly suggests that testing should be considered early in the life of a project. The cost of finding and fixing faults increases dramatically as development progresses. The need to find faults as soon as possible reinforces the need for the quality assurance of documents such as the requirements specification. This is performed using static testing techniques such as inspections and walkthroughs.

Secondly, the V model also introduces the idea of specifying testing requirements when specifying the requirements themselves, prior to performing the actual testing. The acceptance tests are performed against a specification of requirements, rather than against some criteria first thought about when the acceptance testing stage has been reached. It is believed that this will help improve the specification of the requirement itself, building quality management principles into the overall development process and reducing reliance on *post hoc* quality control.

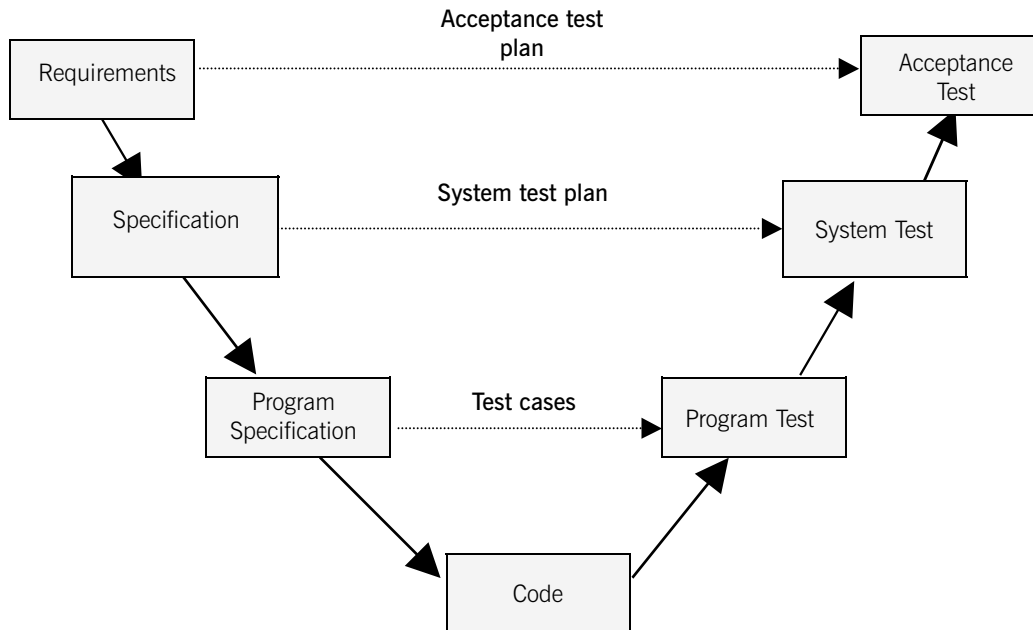


Thirdly, the V model provides a focus for defining the testing that will take place within each stage of the lifecycle. The definition of the testing is assisted by the idea of entry and exit criteria. Hence, the model can be used to define what state a deliverable has to be in before it is allowed to enter the stage and what state it has to be in before it is allowed to leave it and be accepted for the next stage.

Finally, the V model provides a basis for defining who is responsible for performing the testing at each stage. The V model is an excellent basis for the partitioning of quality assurance tasks, highlighting that all the participants in the development of a system have a responsibility for quality.

A potential V model for software enhancements at WyAv is shown in Figure One.

**Figure One: An example V model**



The model begins with the definition of requirements by the engine manufacturers. These are concerned with specifying changes in the environment the software has to run, not in the functionality that it has to provide.

In the specification stage, software engineers at WyAv evaluate the impact of the engine design changes on the existing engine monitoring software. They will have to define the extent of the changes required and the time and cost to undertake them. These costs and timings will have to be confirmed with the manufacturer before proceeding to the next stage.

Program specification is primarily concerned with defining the detailed definition of the changes required to existing programs and the specification, if required, of new programs. Test cases will be specified in advance of program coding for use in the program testing phase.

The bottom of the V model concerns the actual programming of the solution. Programmers code and informally test as they develop the software. The use of paired programmers mentioned in the scenario should assist quality at this level, because assumptions can be challenged and guidance given. Paired programming is a major overhead but illustrates how seriously the company is taking quality.

Program testing formally tests the programs against the test cases defined in program specification. This is supported by formal inspections of all program code by the programming team leader. The team leader ensures that programming standards are adhered to, another major commitment to software quality.

System testing takes place against the tests defined at the end of specification phase. System testing normally takes place within a 'production equivalent' environment and so WyAv will have to provide their testers with an actual engine or a simulation of it. In this application there will also be a strong requirement for *regression testing*. Regression testing attempts to ensure that parts of the software that should have been unaffected by the software changes still work correctly. Initial usability testing will also be performed here to reflect the company's commitment to providing user-friendly software.

Finally, acceptance testing is undertaken by the engine manufacturers who need to satisfy themselves that the software is working correctly before it is released into the live environment. The scenario suggests that WyAv's software engineers support the manufacturers during this acceptance testing. This phase may also include usability testing, dependent on the changes that have been made.

- 1** (a) 1 mark for each significant point (for example, access to supply channels) up to a maximum of 20 marks.
- (b) 1 mark for each significant point (for example, issue of poor credit control) and up to 1 mark for each supporting calculation (for example, accounts receivable – 71 days and rising) up to a maximum of 16 marks.  
Up to 4 additional professional marks for structure, persuasiveness and a coherent conclusion supporting the acquisition of Ecoba.
- (c) 1 mark for each significant point (e.g. classification of stakeholders) up to a maximum of 10 marks.
- 2** (a) Up to 1 mark for identifying each primary activity (for example, inbound logistics) and up to 2 marks for discussing its application to IL in both contexts (metal scrap collection, supplier delivery) up to a maximum of 10 marks.
- (b) Up to 1 mark for each significant point (for example, arrange bought in products to be delivered directly to the customer from the manufacturer) up to a maximum of 15 marks.
- 3** (a) Up to 1 mark for identifying an element of good project management (for example; the allocation of a sponsor). Up to 2 marks for describing the significance of each of these elements within the context of the scenario up to a total of 12 marks.
- (b) (i) Up to 1 mark for each significant point (for example, describing the implications of a quadrant) up to a maximum of 4 marks.
- (ii) Up to 1 mark for each recommendation and up to 2 marks for the justification of each recommendation up to a maximum of 3 marks for each process initiative. Three process initiatives gives a maximum of 9 marks.
- 4** (a) Up to 1 mark for each general characteristic (for example, usability and a general description of what that means) and up to 2 marks for an explanation in the context of the case study, up to a total of 12 marks.
- (b) Up to 1 mark for each significant point (for example; allows tests to be specified in advance against requirements) up to a maximum of 13 marks.