Unit 19: Business Systems for Technicians

NQF Level 3: BTEC National

Guided learning hours: 60

Unit abstract

Engineers are employed in a range of businesses within the primary, secondary and tertiary sectors. Their knowledge and skills are used to carry out a variety of specific functions to solve businesses' needs and contribute to their commercial success. By making effective use of their engineers' expertise, organisations can secure competitive advantage, whether they be a small owner-managed company or a large limited company with many shareholders.

For anyone considering a career in engineering, it is important to have an understanding of how an engineering business operates and its position within society. This unit will develop learners' understanding of business, the engineering industry and the effect of engineering on the environment. It will also give learners a firm foundation for employment in the engineering sector and an understanding of the organisational, financial, legal, social and environmental constraints within which an engineering company operates.

The unit will enable learners to examine an engineering company in detail. This could be either the one in which they are employed or one in a sector of engineering in which they may seek employment. Learners will understand how the company operates, the factors that impact upon the business and the importance of a cost effective output. This will include an examination of the engineering functions of the company and the importance of communication and information flow within the business. This is set within a study of how external factors and the economic environment impact on the company.

Learners will also examine relevant legislation and how it can place considerable constraints on the way that a typical engineering company is required to operate. A company cannot survive if it is not profitable and the unit also allows learners to consider the use and implication of costing techniques on the sustainability of a particular engineering activity.

The unit as a whole provides an opportunity for investigative, relevant and active study that will develop learners' understanding of the factors that affect the ways in which engineering companies operate. The unit will underpin further study of the principles and processes of engineering and will provide an appreciation of the sector.

Learning outcomes

On completion of this unit a learner should:

1 Know how an engineering company operates

2 Understand how external factors and the economic environment affect the way in which an engineering company operates

3 Understand the impact of relevant legislation and regulations and environmental and social constraints on a typical engineering company

4 Be able to apply costing techniques to determine the cost effectiveness of an engineering activity.

Unit content

1 **Know how an engineering company operates**

Sectors: primary eg oil, gas, agriculture; secondary eg chemical, manufacturing, automotive, aerospace, marine, sports; tertiary eg energy distribution, nuclear technologies, waste management, water services, building services, civil, construction, structural, health, telecommunications

Engineering functions: eg research and development (R&D), design, manufacture, materials supply and control, production planning and control, installation, commissioning, maintenance, technical support, technical sales, project planning and management, quality assurance

Organisational types: size eg micro, small, medium, large; status eg sole trader, partnership, public (plc), private (ltd), new, established, charitable, not for profit; structure eg owner–manager, boards, committees, governors, hierarchical, flat, matrix

Information flow: internal systems eg lines of communication, working procedures; people involved eg supervisor, other employees, customers, suppliers; types of information eg work instructions (such as operation sheets, engineering drawings, circuit diagrams), work in progress records, stock/orders/sales; work ethics of communication eg confidentiality, integrity, respect

2 **Understand how external factors and the economic environment affect the way in which an engineering company operates**

External factors: markets; consumers; demographic and social trends; competitive products/services/organisations; customer/client relationships; innovation and technological change; availability of sustainable resources

Economic environment: gross national product (GNP); gross domestic product (GDP); balance of payments; local economy; regional and national economy (such as Regional Development Agency, local/regional skills targets); interest rates; exchange rates

3 **Understand the impact of relevant legislation and regulations and environmental and social constraints on a typical engineering company**

Legislation and regulations: legislation eg Health and Safety at Work Act 1974, Employment Act 2002, Factories Act 1961, Fire Precautions Act 1971; regulations eg Employment Equality (Age) Regulations 2006, Management of Health and Safety at Work Regulations 1999, Provision and use of Work Equipment Regulations 1998, Control of Substances Hazardous to Health (COSHH) Regulations 2002, Lifting Operations and Lifting Equipment Regulations 1998, Manual Handling Operations Regulations 1992, Personal Protective Equipment at Work Regulations 1992, Confined Spaces Regulations 1997, Electricity at Work Regulations 1989, Noise at Work Regulations 1989, Reportable Injuries Diseases and Dangerous

Occurrences Regulations 1998, Working Time Regulations 1998, Workplace (Health, Safety and Welfare) Regulations 1992, Health and Safety (First Aid) Regulations 1981

Environmental and social: environmental constraints eg sustainability, environmental impact, use of renewable resources; social constraints eg employment levels, workforce skill levels and training requirement/opportunities, impact of outsourcing

4 **Be able to apply costing techniques to determine the cost effectiveness of an engineering activity**

Costing techniques: income; expenditure; profit/loss; cost control eg direct cost, indirect cost, fixed cost, variable cost, contribution, marginal costing; assets eg investment and value of fixed assets, depreciation of fixed assets; make-or-buy decisions eg break-even point, investment appraisal

Grading grid

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all of the learning outcomes for the unit. The criteria for a pass grade describe the level of achievement required to pass this unit.

Grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 identify the sectors that three given engineering companies do most business in and describe the engineering function that they carry out in that sector P2 describe the organisational types of three given engineering companies P3 explain information flow through an engineering company in relation to an engineering activity P4 explain the external factors and economic environment that affect the way in which an engineering company operates P5 identify the legislation and regulations and describe the environmental and social constraints that impact upon the operation of an engineering company	M1 explain how improvements in information flow could enhance the functional activities of an engineering company M2 explain the impact of legislation on a specific operation within a typical engineering company in terms of benefits and limitations M3 explain how the cost effectiveness of an engineering activity could be improved.	D1 evaluate the information flow through an engineering company in relation to an engineering activity D2 evaluate the importance and possible effect of the external factors that directly impact on an engineering company.

Grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P6 use costing techniques to determine the cost effectiveness of an engineering activity P7 use costing techniques to reach a make-or-buy decision for a given product and set of business conditions.		

Essential guidance for tutors

Delivery

The four learning outcomes are strongly linked and the delivery strategy should ensure that these links are emphasised. Learners need to gain a coherent view of business systems within an engineering context. This includes how engineering companies operate, the factors that impact upon them (including economic and legislative factors), set within an understanding of the financial needs of being in business. This final aspect is vital to a business if it is to survive and growth. Learners need to not only appreciate the importance and value of their role in the business but also have a wider appreciation of the business of engineering.

The focus of delivery will be very much dependent on the centre's ability to access engineering business organisations. Ideally, centres will have industry links through their learners' employer(s) but, if the course is full time, for learners who are not yet employed this could be through work placements. Alternatively, delivery could be achieved through case studies of local engineering companies that may provide employment opportunities for learners. It is likely that a case study approach would need to be supported by a range of industry visits to enable learners to put the size and scope of engineering as an industry into perspective.

Industry visits, even for learners who are in full-time employment, should form an important part of the unit's delivery strategy. Seeing a variety of engineering companies will provide learners with a much greater appreciation of the diverse nature of the different engineering sectors. This appreciation should include an understanding that engineering is virtually everywhere and not just limited to the more conventional forms of manufacture often depicted in the media. It could be reinforced by making it clear how learners' own music systems are 'engineered' or how the building in which they are studying relies on engineering: the overall structure of the building, its structural materials, the equipment it contains, its maintenance.

The methods of delivery should be, as far as possible, activity based. The learning activities could make use of case studies, researching actual engineering businesses and industry visits. Examples of case studies could include examining structures of engineering organisations, information systems, historical views of changing economic and social environments, the impact of legislation and regulations on a specific engineering company. If learners are employed then it could be useful for them to research aspects of their own company and make comparisons with other industries. For example, a learner working in a small limited company, with only five or six staff, could examine how the business functions of larger organisations (R&D, design, maintenance, technical sales etc) are carried out or vice versa.

Activities could also be set around video footage with learners reviewing a programme (eg on current affairs such as the impact of outsourcing and the global economy or business improvement). Groups of learners could then prepare a presentation (eg poster, formal presentation) of their findings in terms of the engineering functions, information flow, interdependent approaches and so on.

Tutors could also use role play, gaming or modelling to good effect. For example, a modelling exercise to manufacture a particular item (real or imaginary) could lead to an examination of everything from the company required to manufacture it, the legislation and regulations that will impact upon any manufacturing or business tasks carried out, to a determination of cost and likely profit or loss.

The ultimate purpose of the delivery strategy must be to provide learners with as wide an experience as possible of engineering business functions, in all their forms. If learners are to be able to work in a truly independent way but also interpedently within an organisation then this can only come about through a sound understanding of the principles of how engineering companies operate.

Centres will need to carefully consider when this unit is to be delivered within the programme of learning. To be truly effective, the unit requires learners to have an appreciation of the core aspects of the engineering processes being studied (eg manufacturing/production processes) and the language of engineering. This is because they will be exposed to these concepts very quickly as they begin to examine the functions of engineering companies.

Note that the use of 'eg' in the content is to give an indication and illustration of the breadth and depth of the area or topic. As such, not all content that follows an 'eg' needs to be taught or assessed.

Assessment

It is likely that the assessment evidence for pass criteria P1 and P2 could be produced through the study of three separate engineering companies. One of these could be the company in which the learner is employed, with the others through case study or relevant research of companies chosen either by the learner or the tutor. Evidence for criteria P3, P4 and P5 could be produced through the study of a single engineering company, again likely to be one chosen by the learner. The remaining pass criteria (P6 and P7) lend themselves to a controlled and time-constrained activity. Although opportunities to carry out costing exercises in a real environment may be used, it is likely that issues of business confidentiality will prevent this.

This unit could be assessed using three assignments. The first assignment could assess criteria P1, P2 and P3. Information should be given about three separate engineering companies, real or fictitious, ideally one from each sector (primary, secondary and tertiary). The functions that the companies carry out can be simplified, such as designing a solution to an engineering problem or installing a machine. Other information should be given about the size and structure of the organisations.

Work-based learners may wish to use their own company to satisfy part of each criteria, although they will need data on a further two organisations to fulfil the criteria. Written tasks could be given and the evidence is also likely to be in written format.

For P2, sketches may also help to describe organisational structures. For P3, learners need to be able to explain how functions within a business are able to communicate effectively to support business strategies in relation to an engineering activity (eg the link between design and technical sales, manufacturing and material/component supply). This will link to the content section on information flow, where learners need to describe the internal systems, people involved, types of information and work ethics of communication relevant to a specific activity within an engineering company.

A second assignment could allow learners to look at a company as a whole in order to explain the external factors and economic environment in which it operates (P4). They then need to describe the legislation and regulations and environmental and social constraints that have an impact on that company as a whole (P5).

The evidence for the last two pass criteria (P6 and P7) could be gathered through a third assignment involving a costing exercise based on the engineering activity considered in P3. For example, this could involve the use of costing techniques to determine the cost effectiveness of the product/service and then looking at a make or buy decision for part of or the whole product/service. If this is not realistic or appropriate then separate tasks may be necessary. The engineering activity considered in the criteria P3 and P6 could, for example, be the manufacture of a product or the provision of a service. In either case, centres need to ensure that the relevant data is available to cover all aspects of the content, although the product or service itself does not need to be overly complex. A task could then be set to complete a make or buy decision (P7).

To achieve a merit grade, learners will need to apply evaluative skills to explain how improvements in information flow could enhance the functional activities of an engineering company (M1). This could be a natural extension to work carried out for P1, P2 and P3.

Learners should also be able to explain the impact of legislation on a specific operation within a typical engineering company (M2). This has a link with the criterion P5, which considers legislation in a broader context for the company. For merit, learners need to be able to analytically apply the understanding they have gained at pass level to consider the impact of legislation in terms of benefit (eg reduced risk to employees and therefore improved safety record) and limitations (eg increase in production cycle times and therefore, increased costs) for the operation considered. Finally, to achieve the last merit criterion M3, learners should be able to consider the costing exercise carried out for P6 and P7 and explain how the cost effectiveness of the engineering activity could be improved or the make-or-buy decision made more conclusive or even amended.

To achieve a distinction grade, learners should be able to focus on a specific activity and evaluate the information flow through an engineering company in support of it (D1). This links to P2 and P3, where learners described organisational types and explained the information flow for an activity and with M1 their ability to consider enhancements.

The evaluation for D1 should consider the key aspects of the information flow, how it impacts upon the specific activity and other functional activities of the company, plus any issues in terms of problems encountered or opportunities for improvement. As such this could be within the first assignment.

To achieve D2 learners should be able to evaluate the importance and possible effects of the external factors that directly impact on an engineering company. Learners will need to be able to use their general understanding of external factors from P4 but at this level begin to take an analytical view of the relative importance and the direct effects on the business.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit supports aspects of the Level 3 NVQ in Business Improvement Techniques particularly:

- Unit 1: Complying With Statutory Regulations and Organisational Safety.

Essential resources

Learners require access to sufficient data on engineering companies. This can be in the form of case studies, industry visits or data available through learners' employers.

Indicative reading for learners

Textbooks

Chelsom J, Reavill L and Payne A — *Management for Engineers, Scientists and Technologists, Second Edition* (John Wiley and Sons Ltd, 2004) ISBN 0470021268

Nicholas J — *Project Management for Business and Engineering* (Butterworth-Heinemann, 2004) ISBN 0750678240

Tooley M and Dingle L — *BTEC National Engineering, First Edition* (Newnes, 2002) ISBN 0750651660

Key skills

Achievement of key skills is not a requirement of this qualification but it is encouraged. Suggestions of opportunities for the generation of Level 3 key skill evidence are given here. Staff should check that learners have produced all the evidence required by part B of the key skills specifications when assessing this evidence. Learners may need to develop additional evidence elsewhere to fully meet the requirements of the key skills specifications.

Application of number Level 3	
When learners are:	**They should be able to develop the following key skills evidence:**
• using costing techniques to determine the cost effectiveness of an engineering activity and reaching a make-or-buy decision • reaching a decision on cost effectiveness and make-or-buy through interpretation of results, presentation of findings and justification of methods used.	N3.1 Plan an activity and get relevant information from relevant sources. N3.2 Use this information to carry out multi-stage calculations to do with: a amounts or sizes b scales or proportion c handling statistics d using formulae. N3.3 Interpret the results of your calculations, present your findings and justify your methods.
Communication Level 3	
When learners are:	**They should be able to develop the following key skills evidence:**
• using a formal presentation and/or written report to describe and explain the various aspects of the engineering company investigated • using costing techniques, laying out financial accounts for income, expenditure, profit/loss, etc and presenting findings in written form.	C3.1b Make a formal presentation of at least eight minutes using an image or other support material. C3.3 Write **two** different types of documents, each one giving different information about complex subjects. One document must be at least 1000 words long.