

MET IIB Paper 2 cribs – post exam

Q1.

**Good answers should include:**

- *Industry – to identify trends, drivers and business opportunities in key markets*
- *Research organisations – to identify emerging technologies and trajectories*
- *Foresight studies – to identify emerging contexts mentioning specifically; Social, Technological, Economic, Environmental and Political factors*
- *Other Government Departments – to identify related policies*
- *Professional bodies – such as Engineering Institutions to capture domain expertise*
- *Trade Associations - to identify trends in key sectors*

**Good answers will suggest:**

- *The need to summarise guidance to inform policymakers*
- *The need to make the criteria for public support clear to industry*
- *The importance of showing the derivation of recommendations*
- *The need to give general rather than specific guidance which will inform but not dictate detailed interventions. One approach might be the identification of competences as used in the TSB HVM Landscape Document (to which the students have been introduced) eg Resource Efficiency, Manufacturing Systems, Materials Integration, Manufacturing processes, Business models*
- *An indication of the degree of opportunity using eg ‘heat maps’*

**Good answers will explore:**

- *The problems of categorisation and definition of eg sectors*
- *The variability of consultation data from different sources*
- *The (un)reliability of forecasts*
- *Changing international circumstances*

- *Changing commercial circumstances – eg mergers and acquisitions*
- *Unanticipated technical developments eg Google, Facebook*
- *Unanticipated consequences of policy actions*

Q2.

(a) The current industrial system is dominated by a linear material flow that extracts materials, manufactures end products across various factories and processes, sells the products, uses the products and then disposes of them. Explain 4 specific external forces that are seen to limit the long term future of this linear system.

[20%]

*Basis answer could include: Climate change & emissions; resource competition & cost; resource scarcity; resource volatility; energy availability & cost; water competition. Stronger answers expanded upon these, providing an explanation of **how** these forces could impact the linear system.*

(b) Explain how a 'Circular Economy' works to change the linear material flow system. Describe three potential impacts on the manufacturing stages of the system.

[40%]

*Not allowing materials to escape, limiting new materials to those that can be fully restored (this implies an input of only grown materials plus solar-induced energy).*

*Impacts could include the need to learn how to manufacture with renewable materials, how to manufacture with recycled materials that have increased variability, how to retain access to materials that are sold to enable their recovery, how to deliver more value with the same quantity of materials (longer life, upgrading, modular build, life extension), partnering with those who can help to retain material at its highest value. Stronger answers should not only list potential impacts, but describe their impact in detail in the context of a manufacturing firm.*

(c) New business models are argued to be an essential part of a transformation to a Circular Economy through internalising value. Explain how the internalising of value can lead to a

more sustainable industrial system that improves both environmental and economic performance.

[20%]

*Explain value losses that are both economic and environmental such as wasted material inputs, wasted material outputs that are seen as non-value-add, provision of fuel/energy for energy-using products, poor availability of technical products.*

*Reducing wasted value inside one's own economic system reduces cost, while reducing wasted value outside one's own current economic system implies bringing that value in, such as sale-of-service or leasing models. Stronger answers built upon these core issues through descriptions of examples of how this has been achieved in practice, and presented the evidence in a structured manner, showing the interconnection of issues.*

(d) Give two specific examples of innovative business models, explaining their novelty, how they internalise value and the planned or actual benefits achieved.

[20%]

*Examples already taught include AB Sugar who maximise the capture of internal value by creating co-products for all materials they purchase, and/or explaining how they incentivise farmers to deliver higher sugar yield/weight of beet and hence reduce AB Sugar's direct costs. Vitsoe who offer a lifetime, modular product that reduces sales of new versions but increases customer loyalty and word-of-mouth marketing. Riversimple do not sell cars but sell mobility contracts that include the fuel and therefore make more profit when delivering a more fuel-efficient vehicle. A good answer should address all elements of the question (**describe, explain** novelty, **how** they internalise value, and **planned benefits**), not just describe example company examples in broad terms.*

Q3.

*Employees in the UK are provided some level of protection through the Employment Act, and companies have to work within this legal framework in terms of dealing with their human resources. Candidates are expected to think about the situation and provide responses that are clearly linked to the specific context of a company that is **small, early stage, and based around a technology**.*

(a) *The context needs to be described to highlight where potential issues might arise. For example:*

- *The company is a small startup that might not have the same level of sophistication in terms of employee relations and awareness of the legal framework as big established companies do.*
- *The company might not have clearly written employment contracts.*
- *The company is unlikely to have in-house HR and legal expertise, so may have to pay for external advice.*
- *The company might not have clear disciplinary procedures in place.*

*Issues that could arise might include:*

- *The employee might complain of unfair dismissal if proper disciplinary procedures are not adhered to*
- *The employee might complain of sexual or racial discrimination*
- *The employee might go to the employment tribunal and the company could face legal action*
- *The cost of time defending action rather than the actual monetary cost must be considered – for a small company, the CEO might be involved in the case.*
- *Even if non-compete conditions are agreed, the employee may take IP or know how to the start-up's competitors.*
- *The attractiveness of the start-up as a potential employer may be damaged if the employee chooses to go public with their views – this is especially damaging in the era of social media, and when start-ups in clusters are struggling to attract the best people.*

(b) *The steps that need to be taken are quite clear. Basic answers should be able to describe this in outline, with stronger answers expanding upon these and providing more on the way in which step needs to be implemented:*

- *Ensure that disciplinary procedures as described by the ACAS Code of Conduct are adhered to.*
- *Establish the facts of the case – this is highly critical. Ensure that your company keeps clear records of attendance, provided a clear employment contract that stipulates the terms and conditions of attendance, and that you can prove (in case of a tribunal) that the employee has not worked within the boundaries of their employment contract. Understand*

*how long the employee has worked for the company and what rights the employee has under the employment act.*

- *Inform the employee of the problem*
- *Hold a meeting to discuss the problem – this is again about establishing the facts of the case. Understand the root cause of the problem. The first step should always be to rectify the problem rather than immediate dismissal. For instance, is there a health issue? Is there a child-care issue? Can you offer the employee flexible working hours? Can you allow the employee to work from home?*
- *Allow the employee to be accompanied – this is one of the rights of the employee. If the employee is not allowed to be accompanied in this meeting, the company could face penalties if the case goes to an employment tribunal.*
- *Decide on appropriate action based on the facts of the case. If the action is to dismiss the employee, ensure that you work within the employment contract, e.g., what should be the notice period? Ensure that the dismissal letter clearly explains the facts and the reason for dismissal. If possible, get a settlement arrangement with the employee by paying her more than the contractual amount, provided she agrees to not take the case any further. As discussed earlier, it is always preferable to take alternative actions such as giving the employee a formal warning allowing the employee to reform their behaviour. If there are personal or domestic issues preventing the employee from coming to work on a regular basis, considering offering flexible working terms or part-time work. In addition to the attendance records, other facts such as their performance should be taken into account before deciding on the action, e.g., is the employee meeting all the performance targets regardless of their attendance?*
- *Provide the employee with an opportunity to appeal in case a dismissal or alternate disciplinary action is taken.*

Q4.

*The basic answer should cover:*

*Drivers:*

1. *General business issues, such as the emergence of efficient but sometimes fragmented global supply chains; the development of very high performance communication*

*and data transfer capabilities; and the emergence of servitisation / Product Service Systems (PSS) delivered by multiple partners;*

2. *Technology issues, such the speed of change and associated uncertainties resulting from technological advances, both directly related to a firm's business, but also indirectly (e.g. social media and engagement with customers);*

3. *The increasing complexity and interconnectedness of many products and services (e.g. sensors / big data for asset management); and*

4. *Globalisation/localisation issues (e.g. customisation for local markets, 'back flow' of ideas between regions, offset issues, etc).*

5. *The emergence and development of 'open innovation' as concept that companies can seek to implement (e.g. as the visibility of open innovation has increased, it has driven more companies to want to attempt to implement it).*

*Implications:*

1. *Need for the development of collaboration capabilities (e.g. organisations culture, skills, IP management, metrics, etc)*

2. *Need to understand MvB issues throughout value chain, and at the different stages of the technology, product and market life cycles.*

3. *Opportunity to become more ambidextrous (managing both current activities and address potentially 'disruptive' opportunities) and reduce/share risk of attempting this in isolation.*

*A better answer would include:*

*Drivers: Sector variations (drivers are different for high versus low capital intensive; slow versus fast clockspeed; technology intensive versus technology contingent), company variations (big difference for start-ups, SMEs, MNCs); changing role of universities; availability of venture capital allowing creation of both potential competitors but also 'external experiments' for larger firms.*

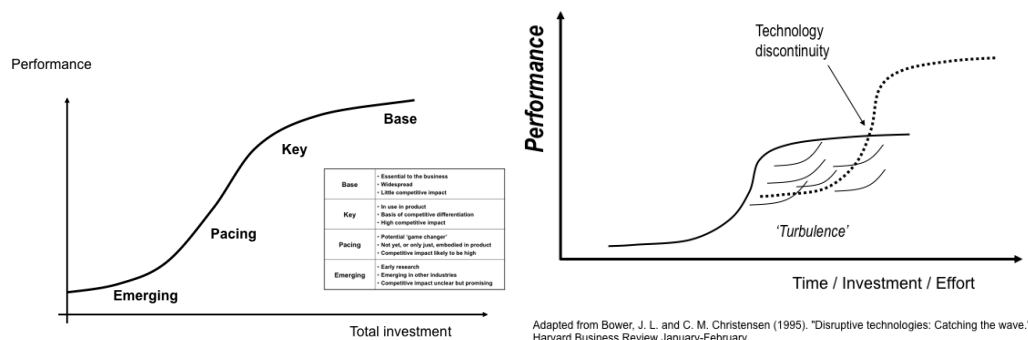
*Implications: Strategic technology management becomes much more about networks and partners > design of collaborative business models and value capture systems become key. IP is more about usage than ownership. Need to develop understanding of broader impact of*

working with external partners throughout the various lifecycles > this is more than external R&D but requires the development of collaborative capability throughout the organisation: R&D, production, HR, finance, Legal, Marketing, etc. Need to be much more effective at monitoring (technology intelligence) and responding to developments in adjacent and unrelated sectors.

Q5.

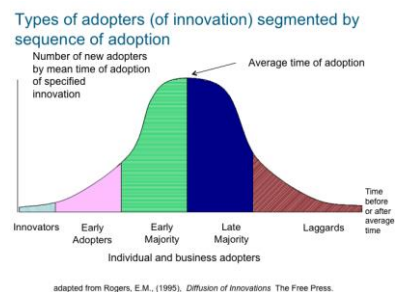
(a) (i)

The technology 's-curve' describes the improvement in performance of a particular technology achieved in response to R&D investments. The level of R&D investment in a particular technology is influenced by many factors internal and external to the firm. S-curves can help to map the performance of single technologies, but can also be used to compare different technologies, and different measures of performance. They can be used to view the relative performance of different technologies within a company's R&D portfolio. Though shown as a curve, it is typically a series of steps and plateaus. It can be very risky to attempt to use for prediction (as shown in the module by the semiconductor example). Other issues that need to be considered are whether this should be used for a single technology, or sub-systems, or complete systems. The richness can get lost if too much smoothing and merging takes place.



(ii) The technology (or market or innovation) adoption curve provides a means to categorise different potential users of a technology, and to use these categories to assess what performance criteria are important to different users. E.g. Innovators are not deterred by the risks of very new technologies. They are adept at fixing them - and because they are good at getting others to pay for them through grants and pilot schemes. In companies they are often charged with assessing new kit.

They not themselves a lucrative market but they help create one. Early adopters want to do something new and believe the technology can help them. They are prepared to pay and are tolerant of faults. The early majority want an improvement on what they have but they want it to be reliable and easy to use. They want to buy from a market leader who will be there to support the technology. The late majority and laggards buy it unwillingly because they feel they have to, to keep up with the competition. But they only buy when the price has come



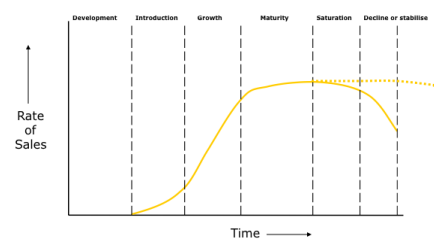
down and the worst bugs have been sorted. They want a complete solution that is not going to create difficulties for them - by requiring them to buy separate peripherals and so on.

This curve can be used to highlight a key challenge for the management of the introduction of a new technology: the 'chasm' that separates the requirements of early adopters from the early majority. Stronger answers should be able to discuss this issue.

(iii) The concept of product life cycle underpins other tools such as the Boston Matrix. The main stages are:

**Introduction:** Here sales volume is low and demand has to be created, customers have to be prompted to try the product. Generally there is little competition as competitive manufacturers watch for acceptance/rejection by market. Costs at this stage are usually high.

**Growth stage:** Here sales volume increases significantly as public awareness increases. Costs are reduced due to economies of scale. Competition begins to increase with new players entering the market. Prices fall as competitors seek to maximize market share. Profitability is usually low, at start but improves as product matures.



**Maturity stage:** Here sales volume peaks, costs are low, but as there is an increase in competitive offerings, prices drop and profitability declines as the market saturates.

**Decline or Stability stage:** Two things can happen now. Either the sales volumes stabilise and the product becomes essentially a commodity, or the volumes fall and the product is eventually superseded. The challenge here is production efficiency to minimise profit reductions

(b)

At the simplest level, these three concepts provide different lenses for considering different aspects of the commercialisation of a new product based upon a technology (i.e. focusing on the technology, product, and customer).

Examples of how connections between these concepts could inform strategy might include the following:

- S-curves can provide a view of the relative readiness of technologies within a company's R&D portfolio (e.g. which technologies are emerging, pacing, key or base? What level or 'readiness' has the technology reached - could refer to Technology Readiness Level (TRLs), and this can be connected to the technology adoption categories for different classes of potential customers for products based upon these technologies.
- Linking the product life cycle to the s-curve can support analysis of the timing of the introduction of new products and avoid the cannibalisation of existing markets.
- Linking the product life cycle to the s-curve can also support the choice of where to target R&D investments, and the timing of these investments. This can also highlight areas where potential problems might occur (e.g. market maturing but replacement product requires a technology that is still at very low level of readiness).
- Linking the technology adoption curve to the product life cycle can help to ensure appropriate expectation of sales growth and realistic business planning.



*Students should also be able to see and explain the links to other concepts such as Technology Roadmapping and Scenario planning as a means to manage the complexity.*

Q6.

*Manufacturing strategy – or sometimes called the operations strategy – is defined as a pattern of decisions, both structural and infrastructural, which determine the capability of a business and specify how it will operate in order to meet a set of operations objectives which have been derived from the business objectives.*

*Good answers may also elaborate on the decision areas in manufacturing strategy:*

- *Facilities - size, location, specialisation*
- *Capacity - amount, timing, type*
- *Span of Process - vertical integration, make vs buy*
- *Process - the transformation processes and the way in which they are organised*
- *Control Policies - production /inventory control, decision making*
- *Human Resources - recruiting, training, motivating*
- *Quality - defect prevention, monitoring, intervention*
- *Suppliers - sourcing policies, supplier relationships*
- *New Product Introduction - how to manage all the above when introducing new products/ services*
- *Performance Measurement - how to measure the above*

*Marketing strategy – for a business is embodied in the marketing mix, ie the means by which the organisation presents its product and services to the customer(s). The mix is usually defined as the 4Ps, and sometimes the S is added:*

- *Price/Profit*
- *Product*
- *Place*
- *Promotion*
- *Service*

*This may also be extended to the 7Ps, when People, Process and Physical Evidence is added to the mix.*

*Brand identity – may be explained by use of the ‘Brand Identity Prism’ which comprise of six different aspects of the identity (usually, but not necessarily, of the product):*

- *Substance*
- *Personality*
- *Relationship*
- *Culture*
- *User image*
- *Self image*

*Each of these concepts was presented and discussed in lectures, and good students should be able to elaborate on their meaning.*

*Discuss how these strategies and the brand identity may be integrated to be part of a coherent business strategy.*

*Effective integration of manufacturing strategy, marketing strategy and brand identity is necessary if the overall business strategy is to be coherent. Students may point out that other functional strategies will also need to be integrated – for example engineering and finance.*

*The key integrating aspect is that the objectives for each of these functional strategies are derived in harmony from the business strategy, which effectively defines how the organisation will compete in a particular business. This may in turn form part of a corporate strategy, and better students may explore the linkage between corporate/business/functional strategies.*

*The close relationship between marketing strategy and brand identity should be described, identifying the product as the key linking factor. It is very important for the marketing strategy and the brand identity to be developed in parallel and to be mutually supportive, in order to avoid giving confusing messages to the market. Better students may explore whether brand identity is part of, influences, or depends on, the marketing strategy. The answer to this depends on the importance attached to brand identity in a particular business. In the context of a business with very strong brand identity(s), the consideration of brand development and communication may even be dominant in the corporate strategy, and apply not only to products, but also services, including the role of individuals such as charismatic leaders.*

*Discuss why and how brand identity may evolve over time, illustrating your answer with examples from the FMCG industry.*

*In some contexts, with consistent and coherent effort, brand identity may be developed over time, to become a very valuable business asset, albeit an intangible asset in the financial accounting sense. An example would be Coca-Cola, where the value of the intangible assets (principally the brand) is of the order of 90% of the stock market value of the company.*

*One model of brand evolution discussed in the lectures is from commodity to function to personality to cultural icon. Good students should be able to give examples of this progression, either from the FMCG examples given in lectures (ice cream brands) or from their own observation and experience.*

*More sophisticated brand development may also be supported by application of brand identity models such as the brand identity prism, based on Kapferer's work, which was presented and discussed in lectures.*