

Q1)

a) p. 336

b) p. 341

c) A market where both buyer and seller preferences matter, i.e. buyer preferences must be matched with seller preferences.

d) p. 336

e) p. 116

f) p. 250

g) Increasing royalty rate with increasing quantity/time

h) p. 211

i) pp. 169-171

Q2

a)

User innovation refers to innovation by users. Such users may include internal users of e.g. a production process that they improve, or external users of products and/or process that they improve and/or adapt to their needs. These innovations may or may not then be incorporated in the products/processes of the producing firm.

Open innovation refers to a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology.

Thus, some, but not all, forms of user innovation are also characterized as open innovation.

b)

Commercial success refers to the event or point in time when an invention finds a commercial application, i.e. it becomes useful in some way, e.g. through being sold or being applied internally (e.g. in production) – this is also the point in time when the invention becomes an innovation.

Commercial success is required for reaching economic success, which refers to the event or point in time when the innovation project reaches a $NPV=0$, i.e. that the discounted positive cash flows have covered the discounted negative cash flows (typically related to innovation investments early on) when applying a relevant discount rate.

c)

The logistic diffusion model is a multi-source model suitable for buyer diffusion when the adopters communicate with potential new adopters, e.g. on a consumer market.

The Fisher-Pry model is a particular logistic model suitable for modelling substitution, e.g. between two technologies. While the logistic diffusion model presents the absolute number of adopters, the Fisher-Pry model presents the relative number of adopters, i.e. the market share of one of the technologies.

Both models are related to S-formed diffusion among the adopters. Formal modelling and graphs for both models are available on pp. 189-191.

Q3 (10p)

Are the following statements **true** or **false**? (The latter alternative – false – should also be used if the statement makes no sense.) No motivation is needed. Indicate for each statement the most correct answer, true or false. A correct answer gives +1p, an incorrect answer gives -1p, and no answer at all gives 0p. The total number of points given from this question will however not be lower than 0p.

1. With the linear inverse demand curve $p = -aq + b$, the function for the *price elasticity of demand* can be written as $\varepsilon = \frac{p}{p-b}$. (see attached) **TRUE**
2. *Expected maximum value* is always less or equal to *maximum expected value* in calculating the expected value of information. **FALSE**
See p. 209
3. The optimal investment in the Nordhaus model of a minor process innovation depends *only* on the exponent in the invention possibility function. **FALSE**
See pp. 163-164
4. With a fixed cost $FC = 10$, and a marginal cost for the n :th unit produced $MC(n) = 3 - 0.1n$ for $n < 20$, and $MC(n) = 1$ for $n \geq 20$, the total cost for producing quantity q is $TC = 10 + 3q - 0.05q^2$ for $0 < q \leq 20$. **TRUE**
See attached
5. Independent of your answer above, given a total cost function $TC = 10 + 3q - 0.05q^2$, there are static economies of scale. **TRUE**
See attached
6. A small firm that for a given quantity sells its products at a price equal to the average total cost (ATC) will not make any profits. **TRUE**
See attached
7. Thomas Hedner (guest lecturer) argued that more power needs to be transferred to the management teams of Big Pharma companies in order to improve the innovativeness of the industry. **FALSE**
see guest lecture.
8. When making an investment evaluation and realizing that the payback method and the IRR indicate that an investment should be made, while the NPV is negative, you should make the investment since two out of three evaluation methods give positive indications. **FALSE**
See ch. 3
9. An investment project with a negative cash flow (-5) in year 0 and a positive cash flow (+7) in year 1 (no other cash flows) has an internal rate of return equal to 40%. **TRUE**
See attached
10. In the classic linear case as presented in the course literature, minor process innovations always lead total revenues that are larger or equal to pre-innovation total revenues, both short- and long-term. **FALSE**
See pp. 198-199

48/100

Q3.1)

$$p = -aq + b$$

$$q = \frac{b-p}{a} \quad \frac{dq}{dp} = -\frac{1}{a}$$

$$\varepsilon = -\frac{1}{a} \bigg/ \frac{b-p}{pa} = \frac{p}{p-b}$$

The Q3

$$4) \quad TC = 10 + \int_0^q (3 - 0,1n) dn = 10 + [3n - 0,05n^2]_0^q = \\ = 10 + 3q - 0,05q^2 \quad 0 < q \leq 20$$

$$5) \quad ATC = 10q^{-1} + 3 - 0,05q \\ ATC'_q = -10q^{-2} - 0,05 < 0 \quad \text{for all } q$$

$$6) \quad ATC = \frac{TC}{q} \quad \leftarrow p \text{ in this case} \\ \pi = ATC \times q - TC = TC - TC = 0$$

$$9) \quad -5 + \frac{7}{(1+r)^1} = 0 \quad 5 + 5r = 7 \\ r = \frac{2}{5} = 40\%$$

Q4) a+b)

$6/2 = 3$
 $6/2 - 4 = -1$

		Your firm	
		Imitate	Innovate
Competing firm	Imitate	0	-1
	Innovate	0	4

$8/2 - 5 = -1$

$8/2 = 4$

$18/2 - 5 = 4$

$18/2 - 4 = 5$

⊗ Or if one of them is unaware of the imitation risk.

c) Probably a waiting game, unless at least one of them is aware of the entire pay-off structure with the complementarities. If so, a first innovator would know that his/her investment would lead to a complementary investment at the other firm. it would still not be a racing game, however.

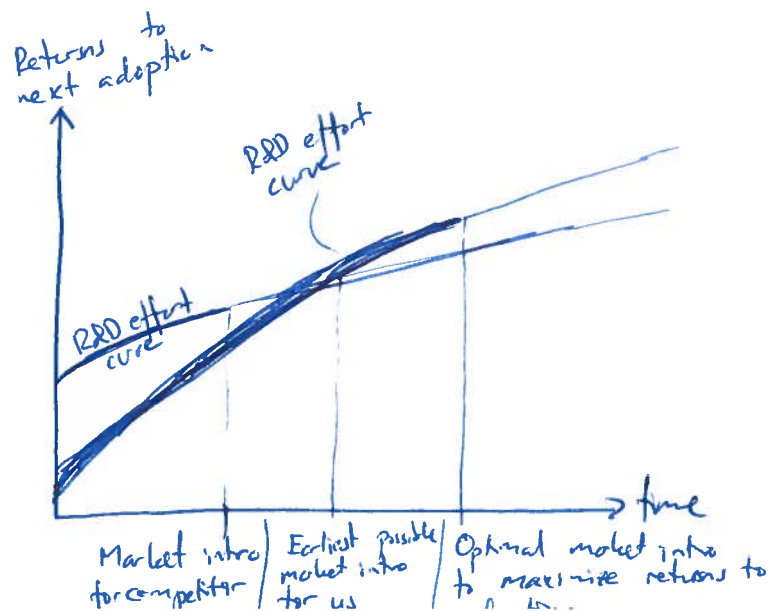
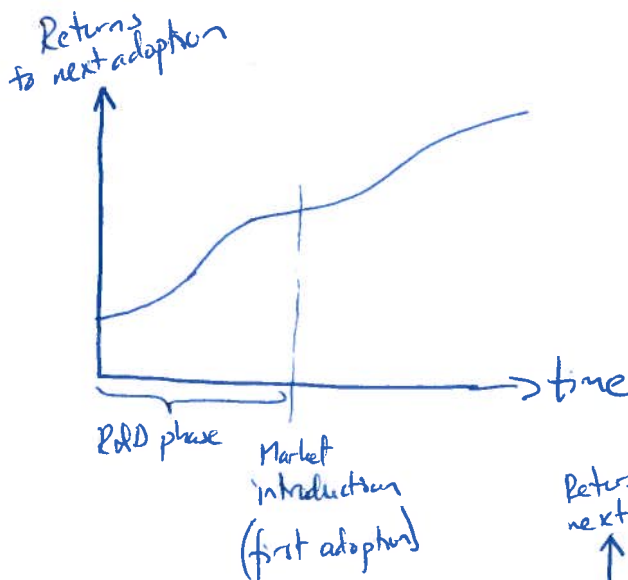
d) For example: The introduction of perfect patent protection would change the pay-off structure (if complementarities are shared equally):

		Your firm	
		Imitate	Innovate
Competing firm	Imitate	0	3
	Innovate	0	5










⇒ Both firms would innovate.

Q5.

- a) See attached.
- b) By applying the CDM the firm could test the various business model hypotheses that the firm has, and identify possible pitfalls early on. It would also ensure that the business model and the related solutions matches with problems that the customers have.
- c) The roles are: Customer (pays), buyer (decides), user, and decision influencer. It is important to consider these since the CDM is based upon interaction with different forms of customers, and if the different customer/purchasing roles are dissociated across several individuals, it becomes more tricky to collect relevant information in the CDM process.
- d) (See also p. 182.) When there is two competing incompatible systems and you want to make sure that your system is chosen above the competing one, you have to make sure that the returns to next adoption for your system is always above the competing system after introduction. If we first assume that both the R&D effort curve and the diffusion curve are S-shaped (over time), and that the initial returns to the first adopter is proportional to the technical performance while there are constant increasing returns to next adoption, we will get two subsequent S-curves with increasing returns to next adopter (over time). If we instead for simplicity assume that the R&D effort curve is subject to decreasing returns to R&D, while there are constant increasing returns to next adoption and linear diffusion, we want to continue R&D as long as the time-derivative is larger for the R&D effort curve than for the increasing returns to next adopter curve to maximize our chances of market dominance. A competitive analysis could however show that less R&D needs to be spent, and that we could introduce our product earlier as long as the returns to next adoption is larger than for the competing system, and that the derivative of the competing firm's effort curve is smaller than the derivative of our increasing returns to next adoption. See figures below.



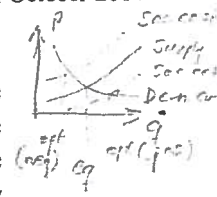
The Business Model Canvas

<p>Key Partners</p>  <p>Customer Industry experts Academics</p>	<p>Key Activities</p>  <p>Efficient manufacturing Innovation/R&D Services</p>	<p>Value Proposition</p>  <p>"Sustainable techs" 3/4 Physical products Emission control catalysts Active pharmaceutical ingredients</p>	<p>Customer Relationships</p>  <p>Collaboration in R&D Strong relationships</p>	<p>Customer Segments</p>  <p>?</p>
<p>Key Resources</p>  <p>Expertise in adv. materials and technology Our people Innovation & collaboration Intellectual property</p>	<p>Channels</p>  <p>?</p>	<p>Revenue Streams</p>  <p>?</p>	<p>Cost Structure</p>  <p>Investments to enable flexible cost base to adapt to demand</p>	

Little emphasis is placed on the right side of the canvas, but on Value proposition that is a bit unclear despite the amount of text. Thus, the firm seems to have a quite "internal" perspective, missing out on how to match that with the needs of the customers.

Solutions & Grading guidelines

Q6 + Q7



Q6 (10p)

p. 303

a) (5p) Show with graphs the difference between the social cost curve and the (private) supply curve in cases of negative and positive production externalities, respectively. Also show the difference between the equilibrium quantity and the socially optimal quantity in both these cases, given a specific demand curve.

(1p per curve 2st
1p per opt + eq. 3st)

Assumptions:
Neg. prodn ext.
Complet. markets
No trans. cost
Perfect markets or courts
Incras. MC for pollution
Interior opt.
Valid def. prop. rights

b) (5p) Describe qualitatively what Coase Theorem says, and how it relates to your response above. Property rights (land markets) find the social opt. in case of neg. prodn externalities under certain conditions. The opt. production is lower than the equil. production. NB: The supply curves are for markets, not for firms. Gov't of a profits pair a

A social planner wants to eliminate profits in the pharma industry by means of price control. Suppose a monopolistic product innovator in that industry has developed a major new drug innovation with approximately linear cost and demand and a substantial investment fixed cost FC (this is the only fixed cost). Let the product innovation be characterized in the standard way by the positive parameters a , b , c , and FC as in the course literature. The tax rate and discount rate is zero, and it is a one-period case. [Throughout this question you need to motivate by clearly showing your calculations.]

(1p on bare FC)

$$P_m = \frac{b+c}{2} \quad (1/4)$$

$$\pi_m = \frac{(b-c)^2}{4a} - FC \quad (1/4)$$

a) (4p) What price p_m would the innovator use for the product innovation if aiming to maximize profit, and what would the resulting profit π_m be, if the social planner is not involved (i.e. in the standard profit-maximizing case)?

$$\pi = 0 \Rightarrow p_r = \frac{b+c}{2} \pm \sqrt{\frac{(b-c)^2}{4} - aFC}$$

(if $FC=0 \Rightarrow p_r = b$ or c)
(Trickspång osv
= höra uträkningsvärd)

b) (4p) What regulated prices p_r would eliminate the innovator's profits (i.e. would give $\pi = 0$)? Hint: Start with expressing profits π as a function of price p rather than as a function of quantity q . Remember that solutions to an equation on the form $x^2 + ax + b = 0$ are given by $x = -\frac{a}{2} \pm \sqrt{\left(\frac{a}{2}\right)^2 - b}$.

$$\pi = p\left(\frac{b-p}{a}\right) - c\left(\frac{b-p}{a}\right) - FC$$

$$p_r = \frac{b+c}{2} - \sqrt{\frac{(b-c)^2}{4} - aFC}$$

since $W = \pi + CS = CS(p) = \frac{1}{2a}(p-b)^2$
increases in p

$$p_r = p_m - \sqrt{a\pi_m}$$

(Simplification facilitates interpretation)

$$p_f = (b+2c)/3$$

c) (2p) Which profit-eliminating price p_r in b) should the social planner choose in order to maximize welfare (as defined in the course literature)? Motivate.

by calcul's



No motivation \Rightarrow no pts
(NB: Guessing or wrong motivation should not pay-off)

d) (2p) Express the social planner's chosen price in c) as a function of the monopolistic price p_m and monopolistic profit π_m .

e) (3p) A representative from the pharmaceutical industry association now suggests that the price should be set in a more fair way in the sense that the fair price p_f should generate a consumer surplus CS that is equal in size with operating profits $\pi_{op} = \pi + FC$. What price p_f accomplishes this?

$$\pi(p_r) - \pi(p_f) = (b-c)^2/36a$$

\therefore A minor loss on a mass market



(NB: Don't forget to mention that the price is set equal to p_f as in e), how much would the profit maximizing innovator then lose in profits compared to the case with a monopolistic price p_m ? Do you see this as a major or minor loss for the innovator? Motivate very briefly.)

Solutions & Grading guidelines (cont.)

Proposal is not feasible since
 $W = PS + CS$ and
 $Soc RoRoI = W/FC = Priv RoRoI \frac{CS}{FC}$
 unless $CS = 0; \rightarrow PS = 0; \rightarrow W = 0 \rightarrow RoI = 0$
 (How perfect price differentiation gives $W = PS$)

- g) (3p) A risk capitalist now enters the debate and argues that price should be set so that the rate of return on investment for the entire society is equal to the private rate of return on investment for the innovator. Is this feasible? Motivate your answer and make necessary assumptions, if any. The innovator's investment FC in innovation is the only investment related to the innovation. Price skimming is not allowed.
- h) (8p) The article below ("De bråkar om procenten" in Dagens Industri, October 16, 2014) outlines a policy debate about the proper level of rate of return on investment for "welfare companies", possibly like the company described above. Considering what you have learnt about entrepreneurial financing and innovation investments in this course, what effects from limiting/capping the rate of return on investment do you foresee with regards to the type of investments that are/will be made in these firms? How could this impact the innovativeness of a "welfare industry" as a whole? Motivate your answer by utilizing financial concepts from the course. [Maximum 1.5 pages of text.]

& differentiation
 ↑
 Limit innov-be growth
 Innov limit be Auton/comp/sta e-ship
 Soc RoRoI often Priv u finn
 (cf π -capping and pat)

- Key features 1-3p
- Effects 1-3p
- Impact 1-3p
- Financ. concepts 1-3p
- Trade-off 1-2p (Similar to Nordbank)

limited risky, long-term innov investm
 " financing (self-financing, VC, equity sales)
 Slow down " proc loans
 Small firms more risky
 Radical innov's more risky

Size of firm/innov 2-3p

Civilminister Ardalan Shekarabi, ansvarig för vinsterna i välfärden, säger att regeringen och V inte har kommit överens om en maximal vinstuttagsnivå i välfärdsbolag.
Men Vänsterpartiets ekonomisk-politiska talesperson Ulla Andersson säger att de visst har gjort det.



vara i den lägre skalan på det ensiffriga beloppet", säger hon. Men hur kommer det sig att civilminister Ardalan Shekarabi säger att någon mer specifik begränsning inte är överenskommen?
 "Det får du fråga regeringen om", säger Ulla Andersson. Är ni verkligen överens om att räntan på insatt kapital ska vara ett ensiffrigt belopp i den nedre delen av skalan?
 "Vi har haft en samsyn vid förhandlingsbordet och nu ska vi tillsätta en utredning tillsammans."
 Ardalan Shekarabi står fast vid sin ståndpunkt, när Di konfronterar honom med Ulla Anderssons övertygelse.
 "Vi utgår från det som står i den skriftliga överenskommelsen", säger han.

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I tisdags sa civilminister Ardalan Shekarabi till Di att regeringen och Vänsterpartiet inte har kommit överens om en särskild vinstuttagsbegränsning i välfärdsbolag.
 "Överenskommelsen är offentlig och där kan man se hur formuleringen ser ut. Pengarna ska gå till vad de är ämnade för och det innebär en vinstbegränsning. Men vi går inte in på några siffror", sa Ardalan Shekarabi.
En fråga om procenten
 Det går på tvärs mot Vänsterpartiets ekonomisk-politiska

talesperson Ulla Anderssons uttalanden förra måndagen i samband med Vänsterpartiet och regeringens offentliggörande av en överenskommelse om vinster i välfärden.
 Ulla Andersson specificerade då hur stora uttag ur välfärdsbolag de kan tänka sig att acceptera.
 "Insatt kapital och låg ränta på detsamma behöver inte återinvesteras eftersom insatt kapital då urholkas. Med låg ränta har vi gemensamt sagt ett ensiffrigt belopp i den nedre delen av den ensiffriga

Di den 14 oktober i år.
 skalan", sa Ulla Andersson bland annat då.
 Ulla Andersson säger fortsatt att hennes uttalande visst är en del av överenskommelsen med regeringen:
 "I vår överenskommelse med regeringen har vi vid förhandlingsbordet haft en samsyn kring vad låg ränta på insatt kapital innebär."
 "I förhandlingsgruppen diskuterade vi olika begrepp. Men vi bestämde oss för att skriva låg ränta, även om vi har haft en samsyn på att det ska

cf π -capping vs $RoRoI$ -capping

- All. financing: Taxes Klev? 1-2p
- All. incentives 1p
- Div. Interfinancing: give higher sector Productivity & R&D spending prop.?
- Impact on diff. forms of e-ship 1-2p
- Portfolio-management 1p
- lengthen TBP, lower econ. success rate

∴ Many sources for pts but also several sources of deductions, i.e. several necessary pts.