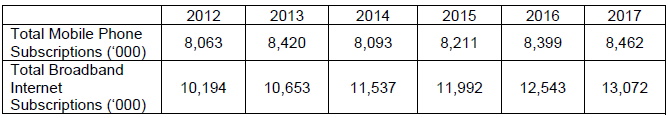
**J2 H1 Economics CSQ – Market Failures (Wi-Fi)**

**Building a Smart Nation**

**Table 1: Mobile and Broadband Internet Subscription in Singapore**



Source: Info-communications Media Development Authority Singapore, accessed July 2018

**Extract 1: Towards Smart Nation Singapore**

The need for Singapore to be a "smart nation", using the latest technology to benefit the country, is about making life better for the people and more. Bringing the current piecemeal uses of technology into a cohesive, nationwide whole "will make our economy more productive, our lives better, and our society more responsive to people's needs and aspirations", Prime Minister Lee Hsien Loong said yesterday at the launch of the Smart Nation initiative. He also envisions it helping the nation to keep abreast of leading cities such as Shanghai, San Francisco and Sydney.

The Government embraced technology to integrate digital technology seamlessly across work, households and public services to boost efficiency and quality of life. One major initiative will be to let people access maps and build up geospatial databases by contributing information such as animal sightings, traffic incidents or the best eateries. During his 35-minute speech, Mr Lee also used an improved mobile application for planning bus journeys, to demonstrate how technology can make life more convenient. "If we can automate the things that are routine, then we can concentrate on the things that really matter."

Source: The Straits Times, 25 November 2014

**Extract 2: Is Singapore’s telecommunications market saturated?**

The telecommunication industry is ending 2017 with the worrying prospect of a tougher new year. The frantic jostling for market share that marked this year can only intensify as new candidates such as Australian start-up Zero Mobile and TPG Telecom enter the market and get ready for battle.

The pressure has been keenly felt in the consumer mobile segment. As OCBC Investment Research analyst Eugene Chua puts it: "It is certainly crowded for a relatively small and saturated market, with little differentiation in network coverage." Juvanus Tjandra, who heads KPMG’s telecommunications, media and technology practice, says: "Looking further ahead, telecommunication companies appear to be bracing themselves for a potential price war and fight for market share by offering lower-tier SIM-only price plans that consumers can leverage without the need of a long-term contract.”

StarHub Pay-TV has also been affected, as offerings like Netflix and Amazon Prime Video chip away at "triple play" which refers to the bundle of mobile, broadband and cable TV services. Mr Tjandra notes that incumbents have worked to address the challenge. StarHub partnered Netflix last year to bring the service to set-top boxes and high-definition streaming.

OCBC's Mr Chua notes: "The most obvious route so far is diversifying away from the traditional telco space - that is, voice and data services - towards providing enterprise digital solutions and related services." And incumbents such as Singtel have already made a play for the enterprise segment, in areas such as cyber security, digital advertising and data analytics.

Meanwhile, gazing into StarHub's crystal ball, Mr Tan, outgoing chief executive of StarHub says: "We believe two types of service providers will co-exist in the mobile market: a few full-service telcos, and many MVNOs that are focused on serving niche market segments, such as the youth, foreign workers, expatriates, tourists and so forth."

Source: The Straits Times, 28 December 2017

**Extract 3: Info-communication technology sector needs more Singaporeans**

Singaporeans were yesterday urged to join the information and communications technology (ICT) sector, which is set to be "abundant" in opportunities and growth potential. Minister for Communications and Information Dr Yaacob Ibrahim made the call, stressing that he needs Singaporeans due to the security concerns of some ICT sectors, particularly cyber security. He added that many industries depend on ICT and it can increase efficiency and productivity.

The growth of the industry will not only create thousands of jobs, but also open new frontiers for the businesses that take advantage of trends like artificial intelligence. Unveiling the Industry’s Transformation Map yesterday, Dr Yaacob let some numbers speak for themselves: By 2020, the sector that already employs 194,000 people will create another 16,000 jobs.

Source: The Straits Times, 4 November 2017

**Extract 4: Free Wi-Fi at all MRT and LRT stations by 2020**

Following in the footsteps of major cities such as New York and Seoul, commuters here will be able to access free Wi-Fi services at all MRT and LRT stations as well as bus interchanges and terminals by 2020. The service has seen 700,000 logins daily at the MRT stations and the trial for the 33 stations cost about S$7.9 million.

Transport analysts agreed that providing wireless connectivity will enhance the commuting experience here but noted the need to have sufficient bandwidth to accommodate the anticipated high Wi-Fi usage. As providing large bandwidth can be costly, experts pointed out that one way to manage the situation could be to offer limited usage on a monthly basis for each commuter which was found to be sufficient for commuters during the trial period. National University of Singapore transport researcher, Lee Der Horng noted that the move to roll out wireless service is in line with the LTA’s MyTransport.SG mobile application providing real-time bus and train-platform crowd updates. “Commuters will be better connected with traffic related updates when they are on the move and LTA can also use the data to generate insights on crowd behaviour and improve the delivery of our public transport services.”

Source: Channel NewsAsia, 13 Oct 2015

**Extract 5: Measures to promote digitalisation in Singapore**

The drive to be a Smart Nation - essentially adopting and reaping the benefits of technology - has made headlines in recent months, even taking centre stage in Prime Minister Lee Hsien Loong's National Day Rally speech in August.

Some of us fear that technology will take away our jobs. On the flip side, going digital can empower and enable us to work more efficiently and effectively. Students would be better prepared for future jobs in a digital age, many of which we may not be able to imagine today. Workers would be better equipped with digital skills, and even more empowered in future workplaces. In addition, businesses can leverage digital capabilities to seize growth opportunities and new markets.

Digital transformation can lead to many opportunities for all and the authorities are making concerted efforts to ensure no one is left behind. Some initiatives to help with the digitalisation of the economy include:

* Silver Infocomm Initiative (SII)

The initiative aims to bridge the digital divide with those over 50 and includes activities such as the Silver Information Technology (IT) Fest and mass IT training classes. The Silver IT Fest is an annual event organised by the Info-communications Media Development Authority (IMDA) with multiple components such as hands-on training workshops, exhibition and seminars held in heartland areas to allow people to experience technology in different ways.

* NEU Personal Computer (PC) Plus Programme

The programme includes the provision of new computers bundled with three years of free broadband access, at an affordable price. Since its introduction in November 2006, the enhanced programme has benefitted 33,000 low-income households with school-going children or people with disabilities.

* SMEs Go Digital Programme

The initiative has three components which takes aim at helping small and medium-sized enterprise (SMEs) build digital capabilities. SMEs can expect step-by-step advice on the technologies they can leverage at each stage of their growth through sectoral Industry Digital Plans (IDPs). They can also receive free business help at SME Centres when it comes to getting information on government schemes and pre-approved off-the-shelf technology solutions. Advice and funding support will also be prepared for SMEs that are ready to pilot emerging ICT solutions.

Source: Adapted from The Straits Times, 19 Nov 2017 and www.guidemesingapore.com, accessed July 2017

**Questions**

(a)(i) With reference to Table 1, compare the trend of mobile phone subscriptions with that of broadband internet subscriptions from 2012 to 2017. [2]

(ii) Using a supply and demand diagram, explain how Singapore’s “Smart Nation” initiative and the entry of new telecommunication operators have accounted for the trend of total broadband internet subscriptions as identified in (a)(i). [6]

(b) Explain how the competitive strategies adopted by the telecommunication operators would impact their revenue and comment on the sustainability of these approaches. [7]

(c) Extract 3 outlines various effects that an expansion of the information and communication technology (ICT) sector can have on the Singapore economy. Explain the effects and illustrate your answer with PPC diagram(s). [5]

(d) Explain why the statement “By 2020, the sector that already employs 194,000 people will create another 16,000 jobs” in Extract 3 is considered a positive statement. [1]

(e)(i) State the main characteristics of a public good and explain why Wi-Fi is not classified as a public good. [4]

(ii) With the aid of diagram(s), explain two reasons why the Singapore government would want to follow in the footsteps of major cities such as New York and Seoul to intervene in the provision of Wi-Fi. [8]

(f) Using case evidence and your own knowledge, discuss the effectiveness of alternative government policies to ensure allocative efficiency in the market for digital services. [12]

[Total: 45]

**Suggested Answers**

**(a)(i) With reference to Table 1, compare the trend of mobile phone subscriptions with that of broadband internet subscriptions from 2012 to 2017. [2] (trend comparison, comparative relationship**

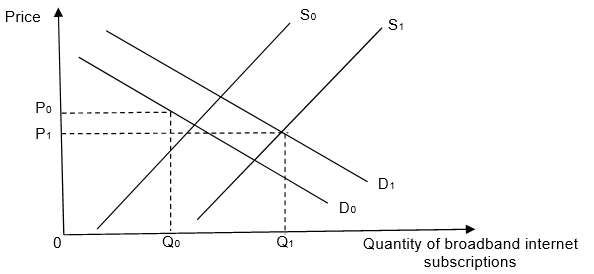
Both mobile phone and broadband internet subscriptions increased. Broadband internet subscriptions increased at a faster rate (28%) as compared to mobile phone subscriptions (5%).

**(a)(ii) With reference to Table 1, using a supply and demand diagram, explain how Singapore’s “Smart Nation” initiative and the entry of new telecommunication operators have accounted for the trend of total broadband internet subscriptions as identified in (a)(i). [6]**

Broadband internet subscriptions have increased sharply in (a)(i) due to a rise in both demand and supply factors which accounted for the large increase in equilibrium quantity.

The Singapore’s “Smart Nation” initiative suggested in Extract 1 drives up demand for broadband internet subscriptions where “The Government embraced technology to integrate digital technology seamlessly across work, households and public services” and “let people access maps and build up geospatial databases by contributing information such as animal sightings, traffic incidents or the best eateries”. The government’s initiative to go seamless might have served as a huge impetus for Singaporeans who does not have broadband subscriptions to sign up for one in order to access government provided services such as “maps and geospatial databases”. Hence this led to a rise in demand for broad band internet subscriptions and caused a rightward shift of the demand curve,

In extract 2, “new candidates such as Australian start-up Zero Mobile and TPG Telecom enter the market and get ready for battle” suggests the entry of new telecommunication operators into Singapore which led to an increase in the number of service providers of broadband internet.



As seen from the diagram, the rise in SS will cause a rightward shift of the SS curve. Together a simultaneous rise in supply due to the entry of more broadband internet operators and rise in demand due to more consumers now utilising broadband internet services to access government led to a large increase in the equilibrium quantity for broadband internet subscription from Q0 to Q1.

**(b) Explain how the competitive strategies adopted by the telecommunication operators would impact their revenue and comment on the sustainability of these approaches. [7]**

Introduction

While telco operators have adopted various strategies to increase their TR in light of the rising competition, they need to be mindful of the fact that these approaches may not be sustainable as they can potentially have a negative impact on the profits of the firm.

Main Body

**1) Explain the pricing strategy of telecommunication operators**

(a) Mechanism

Since the different telcos provide the same service “with little differentiation in network coverage”, the services provided by each telco operator is a close substitute of the others. Hence, demand for the telco service provided by each operator is highly price elastic (PED>1)

(b) Evaluation on revenue

To increase TR, telco operators would lower price (“fight for market share by offering lower-tiered SIM-only price plans”). The fall in price will lead to a more than proportionate increase in quantity demanded of telco services. The loss in revenue due to the fall in price is more than offset by the gain in revenue due to the huge increase in quantity demanded. Hence, there will be an increase in revenue of telco operators. The pricing strategy works to increase TR of a firm only under the ceteris paribus assumption, that is all other factors remaining constant, including the actions of other firms.

**2) Explain the non-pricing strategy of telecommunication operators**

(a) Mechanism

Partnerships with goods that are in complementary demand or targeting niche markets through product differentiation. Since telco services such as broadband or mobile data are complements of online-streaming services, telco operators can tie up with such firms (e.g. Starhub with Netflix).

(b) Evaluation on revenue

If the cost of doing so is greater than the increase in TR, overall the strategy may not be sustainable as it can lead to a loss of profits to firms. The growing trend to watch online-streaming services due to more interesting programmes will mean that such consumers will also have to purchase broadband or mobile data services, hence leading to a rise in demand and TR for telco services.

**(c) Extract 3 outlines various effects that an expansion of the information and communication technology (ICT) sector can have on the Singapore economy. Explain the effects and illustrate your answer with PPC diagram(s). [5]**

**1) Explain the effect of an expansion: Outward shift of the PPC**

As shown in Extract 3, “…many industries depend on ICT and it can increase efficiency and productivity”, so the expansion of the ICT sector drives firms to leverage on the use of technology to develop new and more effective methods of production of goods and services which causes a rise in productivity. This increases the combination of the max quantity of two goods that Singapore can produce, thus increasing its productive capacity.

[Draw and explain PPC]

This is illustrated by a rightward shift of PPC.

**2) Explain the effect of an expansion: Movement from a point inside to a point closer to the PPC**

Assuming that the Singapore’s economy is currently operating near full employment and resources are fully and efficiently utilised, it is at point C which close to the boundary of the PPC. **(actualisation of resources into products)**

With the expansion of the ICT sector, there will be a further outward shift of the PPC curve as shown in Effect 1 due to the rise in productivity. Extract 3 states that “growth of the industry will not only create thousands of jobs”, which refers to more jobs now available in the ICT sector, such as in areas of cyber security and/or artificial intelligence. Existing labour which was previously not used or under-utilized can now take up the new jobs created.

The rise in employment rate due to more people taking up jobs in this sector causes point C to move to point D, where it is closer to the new full employment of the economy (TU).

**(d) Explain why the statement “By 2020, the sector that already employs 194,000 people will create another 16,000 jobs” in Extract 3 is considered a positive statement. [1]**

One of the characteristics of a positive statement is that it can be verified by looking at evidences. The above statement is positive because we are able to verify that there are 16,000 job vacancies available in the market in 2020 by examining the jobs market.

**(e)(i) State the main characteristics of a public good and explain why Wi-Fi is not classified as a public good. [4]**

The two main characteristics of public goods are non-rivalry and non-excludability.

Explain non-rivalry characteristic and explain why Wi-Fi is rivalry in consumption

The good is non-rivalry in consumption when the consumption of the good by one person will not reduce the quantity available to the next user.

Wi-Fi is rivalry in consumption because as stated in Extract 4 “… need to have sufficient bandwidth to accommodate the anticipated high Wi-Fi usage” which means that when one user taps on the Wi-Fi network, it will reduce the available bandwidth and speed of the connection available to the next user.

Explain non-excludability characteristic and explain why Wi-Fi is excludable

Non-excludability means the government cannot prevent non-payers from consuming the good. One the service is provided, any user will be able to enjoy the service even if the user does not pay for it.

Wi-Fi is excludable because users are required to sign up and login before they can use the public Wi-Fi network “The service has seen 700,000 logins daily” in Extract 4. It is hence possible to exclude selected users from enjoying the Wi-Fi services.

**(e)(ii) With the aid of diagram(s), explain two reasons why the Singapore government would want to follow in the footsteps of major cities such as New York and Seoul to intervene in the provision of Wi-Fi. [8]**

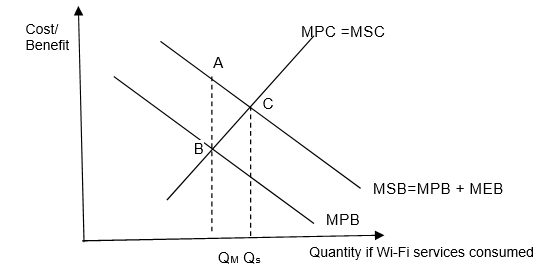
Due to the characteristics of rivalry and excludability, Wi-Fi is not a public good but a private good. The Singapore government intervenes in the provision of Wi-Fi because it is a merit good and there are large positive externalities that arises from the consumption as well as imperfect information. If left to the market, there will be under- consumption and inefficiency in resource allocation.

Explain how positive externalities in Wi-Fi leads to market failure

Positive externalities are external benefits to 3rd party who are not directly involved in the consumption of the good and does not have to pay for it.

The use of Wi-Fi as stated in Extract 4 will enhance productivity as “Transport analysts agreed that providing wireless connectivity will enhance the commuting experience” and “Commuters will be better connected with traffic related updates when they are on the move...”

The 3rd parties who benefit are the firms and economy when commuters tap on the wireless network to plan their routes more effectively, they reduce travel time and firms and the economy enjoys a rise in productivity from more output due to less time spent on commuting.



As seen from the diagram, the presence of the external benefit causes a divergence between MPB and MSB by the amount of MEB. Referring to the diagram below, MSB lies above MPB as a result of the MEB. Assuming there are no external costs, MPC=MSC. Individuals will only consume Wi-Fi at the point where MPB=MPC where their private self-interest are maximised at QM. However, socially optimum level of consumption of Wi-Fi by the economy is where MSB = MSC and all true costs and benefits have been taken into consideration at Qs.

From QM to QS, there is under-consumption of Wi-Fi if left to the individuals. The summation of the loss of net benefit not reaped from QM to QS where every unit that is under-consumed adds more to the society’s benefit than cost forms the deadweight loss to society (Area ABC).

Consumption of Wi-Fi may also be under-consumed due to imperfect information. Some groups of consumers underestimate the benefits from the use of Wi-Fi services due to ignorance or lack of familiarity. Hence the MPB perceived is lower than the MPB actual resulting in under-consumption by the market.

In summary, the government needs to intervene in the provision of Wi-Fi to reduce under consumption and improve efficiency in resource allocation.

**(f) Using case evidence and your own knowledge, discuss the effectiveness of alternative government policies to ensure allocative efficiency in the market for digital services. [12]**

1) Public education

* Silver Infocomm Initiative which “aims to bridge the digital divide with those over 50” and includes exhibitions and workshops
* Helps to enable consumers to experience and understand the benefits of using digital services to enhance the convenience in their lives
* Effectiveness of policy:
  + [Root cause] Addresses the market failure due to imperfect information
  + Reduces the divergence between MPBperceived and MPBactual such that the consumption of digital services is closer to socially desirable level and allocative efficiency is achieved
  + [Conditions] Depends on availability of govt budget
    - Organisation of public roadshows and workshop will mean that government incurs an opportunity cost due to a limited government budget
    - To reduce the opportunity cost, government in Singapore uses public education to specifically target those above 50 and in heartland areas. This demographic profile may be less IT savvy because they do not use it in their day-to-day lives or at work.
  + [Conditions] Depends on willingness and ability of the older generation to embrace the use of digital services.
    - Older generation may have the perception that digital services are very complex and hence less willing to explore usage
* [Evaluation] While public education incurs recurring spending over a period of time, this is unlikely to have to persist in the long run for Singapore because younger generations are digital natives who are more IT savvy due to early exposure in school at work

2) Subsidies

* NEU PC Plus Programme that provides new computers with broadband at an affordable price to students
* SMEs Go Digital Programme has govt funding support for SMEs that want to pilot ICT solutions
* Amount of subsidy equal to amount of MEB
* Cost of using digital services is reduced, MPC curve shifts downwards by full amount of subsidies.
* Consumption increases to the socially desirable level and allocative efficiency is attained
* Effectiveness of policy:
  + [Root cause] Addresses the market failure due to positive externalities
  + [Conditions] Depends on availability of govt budget
  + [Conditions] Depends on accuracy of govt information
  + If govt inaccurately estimates MEB, it may end up over-subsidising the provision of digital services, which leads to overconsumption and deadweight loss
* [Evaluation] Govt tries to avoid the situation of oversubsidising by only subsidising the lower income group of students, or SMEs rather than all individuals or firms. While such targeted subsidies may not bring the consumption of digital services to the socially optimal level, it is nonetheless still effective in reducing the extent of allocative inefficiency.

3) Direct provision

* Free Wi-Fi provided in public transport network (Wi-Fi considered an example of digital service
* Govt decides on the socially desirable level of Wi-Fi, produces that amount and provides it for free
* Effectiveness of policy:
  + [Conditions] Depends on accuracy of govt information
  + Some may argue that free provision leads to overconsumption when govt does not have accurate info about the socially optimal level
* [Evaluation] Likely that government has considered the social benefits of the consumption of digital services to be so high that it is worth it to provide the service for free.