

## **2. Literature Review**

### **2.1 Mobile Products and Services**

There are a number of basic wireless services. Basic service provides the subscriber with complete capability, including necessary terminal equipment, to communicate with another subscriber. The basic services of wireless network are augmented by various supplementary services (more often known as Value Added Services, VAS), e.g. call forwarding, call barring, etc.

Apart from the basic services, equipment vendors (e.g. Ericsson, Nokia) may design their equipment to provide innovative services to differentiate their products from competitors'.

To be able to use or activate a certain service, users have to subscribe to it. Some of the services are available for every subscriber; these are defined as basic services. Value added services are only available for subscribers who subscribe to it, and activation of a VAS typically requires a subscriber to pay more.

Due to the continuous improvement in technology, changing customer demand, new wireless services will continuously be introduced. New services create value for the subscribers and improve their standard of living.

**Table 8: Wireless Technology and Internet Presence**

	Maxis	TM Cellular	Celcom	DiGi	Time dotCom
Wireless Technology	GSM 900	GSM 1800 DAMPS 800 – close end 2002 NMT 450 – close in 2003	GSM 900 ETACS 900	GSM 1800	GSM 1800
Major share holder	Usaha Tegas	Telekom Malaysia Bhd	TRI	Telenor and Berjaya	Time dotCom
Internet presence	Yes <a href="http://www.maxis.com.my">www.maxis.com.my</a>	Yes <a href="http://www.tmtouch.com.my">www.tmtouch.com.my</a>	Yes <a href="http://www.celcom.com.my">www.celcom.com.my</a>	Yes <a href="http://www.digi.com.my">www.digi.com.my</a>	Yes <a href="http://www.time.com.my">www.time.com.my</a>
Online customer service	Yes	Yes	Yes	Yes	Yes

The above table was constructed based on data from Asiacom 30/10/2001 and websites of the service providers. From the table, it is expected that by 2003, there will only be GSM systems (900 and 1800 systems) operating in Malaysia. Therefore, it is important to know the products and services available in GSM technology, and its trend and development roadmap, which are going to be discussed in the following subsections.

### **2.1.1 Basic Services**

Wireless service providers in Malaysia package the basic and value added services in different ways. We may find some VAS available in a basic package, and some basic services available in the VAS package.

The following table list the basic services according to GSM Handbook Phase II (GSM MoU SE 18) and providers that provide the services.

**Table 9: Basic Services**

Basic Services	Providers
Normal telephony	Maxis TM Cellular Celcom DiGi.com Time dotCom
Voice Mail	
Emergency Calls (112)	
SMS	
<ul style="list-style-type: none"> <li>• Mobile Terminating</li> <li>• Mobile Originating</li> </ul>	
Cell broadcast	
Facsimile Group 3	

Table 9 shows that all providers offer basic GSM services.

For a detailed description of the services, please refer to Appendix C.

### 2.1.2 Supplementary Services

A supplementary service is an "add-on" service which supplements a basic telecommunications service. It modifies or supplements basic services, and is more often referred to as Value Added Services (VAS).

Since service providers package the services differently, a subscriber would have to choose accordingly. She is not totally free in choosing the VAS she would like to subscribe to due to the different way providers group the services.

**Table 10: Value Added Services**

VAS	Providers
Call forwarding <ul style="list-style-type: none"> <li>• on MS not reachable</li> <li>• on MS busy</li> <li>• on no reply</li> <li>• unconditional</li> </ul>	All providers provide these services.

Call Barring Outgoing calls <ul style="list-style-type: none"> <li>• all outgoing calls</li> <li>• all outgoing international calls</li> <li>• outgoing international except those directed to the home country</li> </ul> Incoming calls <ul style="list-style-type: none"> <li>• all incoming calls</li> <li>• barring when roaming outside home country</li> </ul>	
Call waiting	
Call hold	
Multi-party conversation (telephony only)	
Advice of charge (AoC) <ul style="list-style-type: none"> <li>• estimation of the bill</li> <li>• for data calls, on the basis of time measurements</li> </ul>	All providers do not provide this service.
Calling line identification presentation (CLIP)	All providers provide these services.
Calling line identification restriction (CLIR)	
Connected Line Identification Presentation (COLP)	All providers do not provide these services.
Connected Line Identification Restriction (COLR)	
Itemised Billing	All providers provide these services.
International Roaming	

From the above table, it can be seen that no provider offers a VAS that is not offered by other providers. Hence, services are not differentiated much among operators.

### 2.1.3 Innovative Products or Services

Apart from competing on the above services, wireless service providers also compete on other innovative products or services. Off and on, they will launch promotional program to attract new subscribers.

Below are some of the innovative products and services offered by Malaysian wireless service providers to consumers:

#### 2.1.3.1 Prepaid

Prepaid was introduced in late 90s and has become an important growth factor to the local mobile industry since then. All service providers provide prepaid service (with

different charges or packages). It is possible to use prepaid for differentiation or market segmentation as the calling rate of the prepaid program of each provider is different, and may suit different segment of users.

The prepaid service that arrived in the late 1990s has grown in a very rapid rate and gained popularity, as can be seen from the following two tables.

<b>Table 11: Top 10 prepaid markets (Jun 2001)</b>	
	(%)
Philippines	90
Fiji	89
Cambodia	87
Indonesia	77
Vietnam	75
New Caledonia	68
New Zealand	68
Malaysia	50
Northern Marianas	36
Singapore	30

Src: ASIACOM 16 Oct 2001

Note: SE Asia end-June 01

<b>Table 12: Prepaid vs. postpaid subscribers</b>		
	Postpaid (%)	Prepaid (%)
1998	92	8
1999	76	24
2000	55	45
2001 Jun	49	51

Src: ASIACOM 16 Oct 2001

Note: SE Asia 1998-1H01

From the above table, more than half (51%) of the mobile subscribers in Malaysia are using prepaid as of Jun 2001.

During 2000, more than 70% of the worldwide mobile market's net additions were prepaid (ASIACOM 12 June 2001). The service is popular for users who need access but do not generate lots of traffic (low utilisation).

According to Neumann (Wellenius et. al., pg25), as the penetration rate of potential subscribers increases, the value of subscribing to the service also increases. Each interactive service requires a **critical mass** of subscribers before a self-reinforcing growth process can set in. This critical mass phenomenon depends not only on the subscribers but also on the different service providers and the relationship between them. The probability of getting a critical mass of subscribers decreases with the number of competitors.

- Prepaid has helped the local operators to growth continuously in the past few years.

Note that the actual number of prepaid users may be less than the number of registration as some users might have multiple subscriptions. In addition, once a prepaid SIM (Subscriber Identity Module) card is out of order, the user would have to get a new number (new subscription) if they are not provided with option to replace the SIM and reuse the previous number.

### 2.1.3.2 SMS

Although SMS is one of the basic services of GSM, it can be enhanced by delivering more content and is getting more and more popular.

**Table 13: SMS tariff vs. usage (US\$)**

Country	Operator	SMS Tariff	1 min. peak voice call	Peak Voice/SMS Ratio
Philippines	Globe	0.02	0.15	7.50
<b>Malaysia</b>	<b>TM Cellular</b>	<b>0.03</b>	<b>0.17</b>	<b>6.54</b>
Indonesia	Satelindo	0.02	0.13	6.50
Singapore	Singtel	0.02	0.12	5.75
New Zealand	Telecom NZ	0.08	0.17	2.13
Australia	Telstra	0.11	0.19	1.73
Thailand	TAC	0.07	0.08	1.18

Src: ASIACOM 16 Oct 2001

The above table shows that the SMS tariff in Malaysia is the second lowest, with Philippines, Indonesia and Singapore having the cheapest rate. When comparing the peak voice/SMS ratio, Malaysia is the second highest behind Philippines.

The higher the peak voice/sms ratio is, the more the subscribers are motivated to use SMS instead of voice call.

SMS is very popular in Philippines. With recent development like greetings, song dedication, sending of logo via SMS and other mobile entertainment (e.g. ringing tone, graphics, etc), the potential of SMS is being exploited more fully in Malaysia.

In addition, all service providers use SMS to send stock price to subscribers. According to Celcom, its SMS growth had been 1,000% from around Apr 2001 to Sep 2001, in six months' time. As Celcom is opening its SMS to prepaid customers, there might be additional growth in its SMS traffic.

Other benefits of using SMS are as follows:

- useful when people need to communicate but could not talk, e.g. when they are in the court room, bank, meetings, etc
- messages are usually delivered instantly, even though the receiver has roamed to other countries
- information such as numbers and address can be delivered more accurately and easily compared to voice call
- good for delivering little bit of information, e.g. a confirmation, if the sending party do not want to talk directly with the receiving party
- young users can be seen as using state-of-the-art gadget among peers

#### **2.1.3.3 International Calling Card**

Service providers provide this service with different charges or packages. Competition would be on ease of use and price. Calling card is only useful for making outgoing calls. It cannot be used to receive calls.

#### **2.1.3.4 Loyalty programs**

It may differentiate an operator from its rivals, e.g.:

##### **1. Maxis**

- monthly phone bill can be credited into Bonuslink (another loyalty program) points. Users can exchange goods when they have accumulated enough points.
- Select One Club
  - Gold card member if monthly bill more than a certain amount
  - Free subscription



- Rebate for loyalty – subscribers that stay with Maxis for certain number of years get some rebate from phone bill. This helps to reduce churns.
- Rebate for early settlement of bill. This helps to reduce bad debt.

## 2. TM Cellular

- Real Reward – similar to Maxis' Bonuslink program but this is in conjunction with TMB's fixed line service.

### 2.1.3.5 WAP

DiGi's UOB-DiGi Mobile Banking has a motto: "Banking At Your Fingertips". It is a mobile banking service using WAP (Wireless Application Protocol) technology. The service requires no connection fee with a monthly fee of RM5. User can check bank account balance, transfer fund, pay bill and perform a whole lot of others banking transactions at any time and place at his convenience. He does not need to drive to the bank, find a car park or get stuck in the long queue just to do his daily banking activities since he can carry out transaction with his mobile phone.

Other providers also have WAP services with different subscription rates.

### 2.1.3.6 New Technology and Vendor Specific Features

Time dotCom launched its GPRS service ahead of all other competitors, at a rate of 5sen/min. Other providers are planning to launch soon, e.g. Celcom plans to commercially begin GPRS services in early 2002.

Celcom links their mobile service to non-communication services, so that the SIM card has other uses. For instance, subscriber can dial-a-coke from his mobile and the charge will appear on his phone bill.

There may be some vendor specific implementation that can be used for differentiation,  
e.g. Ericsson equipment support the following features (Ericsson 1994):

Ericsson Mobile Intelligent Network services are as follows:

- single personal number (subscriber has multiple subscriptions in several networks)
- dual numbering (subscriber has two numbers under the same subscription)
- immediate call itemisation (bill 3<sup>rd</sup> party, e.g. for rented phone)
- Freephone service
- Credit card calling
- Originating call screening
- Terminating call screening
- Location-dependent services

## 2.2 Trends and Developments of the Industry

### 2.2.1 Roadmap of Data Services for GSM

The following is a roadmap of data services for GSM. In foreseeable future, we would have more bandwidth using GPRS, EDGE and UMTS.

**Table 14: Roadmap of Data Service for GSM**

Date	Milestone
Throughout 1999	Network operators place trial and commercial contracts for GPRS infrastructure
2000	Incorporation of GPRS infrastructure into GSM networks
Summer of 2000	<ul style="list-style-type: none"><li>- First trial GPRS services become available. Typical single user throughput is likely to be 28 kbps.</li><li>- For example, T-Mobil is planning a GPRS trial at Expo2000 in Hanover in the Summer of 2000</li></ul>
Start of 2001	Basic GPRS capable terminals begin to be available in commercial quantities
Throughout 2001	<ul style="list-style-type: none"><li>- Network operators launch GPRS services commercially and roll out GPRS.</li><li>- Vertical market and executive GPRS early adopters begin using it regularly for nonvoice mobile communications</li></ul>
2001/2	<ul style="list-style-type: none"><li>- Typical single user throughput is likely to be 56 kbps.</li><li>- New GPRS specific applications, higher bitrates, greater network capacity solutions, more capable terminals become available, fuelling GPRS usage</li></ul>
2002	<ul style="list-style-type: none"><li>- Typical single user throughput is likely to be 112 kbps.</li><li>- GPRS Phase 2/ EDGE begins to emerge in practice</li></ul>
2002	GPRS is routinely incorporated into GSM mobile phones and has reached critical mass in terms of usage. (This is the equivalent to the status of SMS in 1999)
2002/3	UMTS arrives commercially

Src: [www.mobileipworld.com](http://www.mobileipworld.com)

The following table provides more information on the data capabilities of the GSM “family”.

**Table 15: GSM, GPRS, EDGE & 3G Data Service Capability**

	Timeframe	Capabilities	Notes
9.6 kbps service	Available today	Circuit-switched data and fax	Service available from most GSM operators today.
14.4 kbps service	Available over next 12 months	Higher speed circuit-switched data and fax	Should work identically to 9.6 kbps service only at higher speed. V.42 bis compression will further increase throughput by about 200%.
Direct IP Access	Available from some carriers today	Circuit-switched connection directly to Internet	Reduces call set-up time and provides a stepping stone to packet data. Will also be available for high-speed circuit-switched data services.
High-speed circuit-switched data service (HSCSD)	Available within 12 months	High speed rates to 56 kbps	A software-only upgrade for carriers not requiring expensive infrastructure. Operators will need to decide whether to offer this service or GPRS or both.
GPRS	Available within two years	High speed packet data with transmission speeds over 100 Kbps, with most user devices offering about 56 kbps	Extremely capable and flexible mobile communications.
EDGE	Available within three years	High speed packet data which will triple the rates available with GPRS	Final high-speed data technology for existing GSM networks. Will also be used with IS-136 TDMA networks.
Third generation cellular, UMTS	Available within three to five years	High speed packet data to 2 Mbps	Completely new airlink.

Src: PCS Data Today, September 30, 1998

When 3G cellular service is available, it is expected to achieve high speed packet data of 2 Mbps at the mobile terminal, which is in theory, as good as an E1 link today. Many services including video can be transmitted over such connection.

### 2.2.2 Applications for GPRS

Since there is almost no delay before sending data, GPRS is ideally suited for applications such as extended communications sessions, e-mail communications, database queries, dispatch, and stock updates to name just a few. In addition, the high throughput of GPRS will remove many of the obstacles from the use of multimedia and graphical web-based applications. For example, mobile users will be able to easily use graphically intensive web-based map application to get directions while travelling. Furthermore, with almost no transmission delay and high throughput, it will be more practical to use enterprise applications such as SAP wirelessly and remotely.

**Table 16: Preliminary GPRS Subscriber Forecasts (Asia Pacific)**

Year	Subscribers (mil.)
2000	0
2001e	2.7
2002e	14.1
2003e	27
2004e	38
2005e	36.5

(Src: The Yankee Group, ASICom, 16 Oct 2001)

Table above shows that industry analysts expect GPRS subscriptions will grow from 2001 to 2004, and decline from 2005 onwards. This is due to the introduction of higher bandwidth technology such as EDGE (Enhance Data Rate for GSM Evolution) and UMTS (Universal Mobile Telecommunications System).

**Table 17: Data services delivered over 2G/2.5G**

Service	Minimum speed (kbps)	Acceptable speed (kbps)	Best speed (kbps)	HSCSD	GPRS	EDGE	UMTS
Simple messaging (chat)	-	1	9.6	Y	Y	Y	Y
Auction updates	-	1	9.6	Y	Y	Y	Y
Telemetry	-	9.6	28	Y	Y	Y	Y
Email	9.6	9.6	56	Y	Y	Y	Y
Mobile banking	9.6	28	56	Y	Y	Y	Y
Travel updates	9.6	28	56	Y	Y	Y	Y
Remote LAN access	9.6	56	384	Y	Y	Y	Y
File transfer	14	56	384	Y	Y	Y	Y
Remote security	28	56	128	N	Y	Y	Y
Web browsing	28	56	128	Y	Y	Y	Y
Audio	28	56	128	Y	N	Y	Y
Video	28	128	384	Y	N	Y	Y
Entertainment videostream	128	384	2Mbps	N	N	Y	Y
Video games	128	384	2Mbps	N	N	Y	Y

Src: ASICom, 16 Oct 2001

Notes: Y=Yes, N=No

With the bandwidth of GPRS, it is possible for users to run more applications on the mobile terminal. The table above listed some of these applications. In addition to that, services such as textural and visual information, still and moving images, document sharing/collaborating working, job dispatch and vehicle positioning are possible to be delivered by GPRS ([www.mobileipworld.com](http://www.mobileipworld.com)). More information on GPRS is available in Appendix E.

### 2.2.3 Third Generation Wireless Systems

Compared with second generation systems, 3G systems offer better system capacity; high-speed, wireless Internet access (up to 2 Mbps), and wireless multimedia services, which include audio, video, images, and data. Systems such as GPRS and EDGE bridge second generation systems into third generation systems. In 3G systems, new network technologies such as ATM (Asynchronous Transfer Mode) backbone, network management, and service creation are integrated into the existing second generation core networks. Air interfaces such as Wideband CDMA (W-CDMA) and cdma2000 are major 3G radio standards.

The increasing number of Internet and multimedia applications is a major factor driving the 3G wideband wireless technology. By the end of 1999, wireless data services were marketed as modem access for laptop. As the advanced 3G infrastructures become available, and the inexpensive wireless handheld devices (e.g. wireless personal data assistant and wireless smart phones) become popular, subscribers will begin to enjoy instant wireless Internet access. Services include sales force automation, dispatch, instant content access, banking, e-commerce, and so on (Lin & Chlamtac).