Evolution of Mobile Handsets and the Impact of Smartphones

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InfoCom Research, Inc.
Mobile handset history outlook:

*Handsets have changing dramatically especially in this decade.*

- Industry structure is changing after the growing smartphone popularity
- Handset development trend is also changing with the smartphone

*What are the future phones like???
Feature Phone vs. Smartphone

Smartphone? OR Feature phone?
Mobile Handset Market Overview
Global Mobile Subscriber Number & Penetration History

5.4 billion mobile phone subscribers and 77% of mobile penetration, globally

(in million)

- Subscriber Number
- Net increase
- Penetration Rate

Source: US Census Bureau, Informa and 4G Americas. As of September, 2011
Mobile Subscriber and Penetration Rate by Region

- **Asia Pacific**: 2,624 million subscribers, 96.1% penetration
- **China**: 859 million subscribers, 95.2% penetration
- **Japan**: 121 million subscribers, 69.6% penetration
- **North America**: 328 million subscribers, 95.3% penetration
- **South America**: 569 million subscribers, 96.1% penetration
- **West Europe**: 531 million subscribers, 129.3% penetration
- **East Europe**: 511 million subscribers, 127.0% penetration
- **Africa**: 538 million subscribers, 53.1% penetration
- **Middle East**: 287 million subscribers, 89.8% penetration

### Notes
- **Source**: Informa and US Census Bureau
- **As of December 2010**
Subscriber Number by Technology

Technology based subscriber share: Global

<table>
<thead>
<tr>
<th>Technology</th>
<th>Subscriber</th>
<th>Market share</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSM</td>
<td>4,300</td>
<td>77.0%</td>
</tr>
<tr>
<td>UMTS (W-CDMA) –HSPA</td>
<td>692</td>
<td>12.6%</td>
</tr>
<tr>
<td>CDMA</td>
<td>521</td>
<td>9.5%</td>
</tr>
<tr>
<td>Others (Analog, iDEN, PDC, TD-SCDMA, TDMA)</td>
<td>46</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Data: As of March 2011

※Source: 4G Americas
Handset Market Structure

 Market Structure

Price range and its volume

High-end/Smartphone

Price: $ 800~

Middle range

Price: $ 300~

Low End including ultra low end

Price: $ 20-50

One of the best selling phone in history

Nokia 1100

- Low end
- Black-white display
- 86 gram
- SMS
- Color variation
- Target: emerging market
※NO Internet
NO Camera

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- Handset Market Structure

- Market Structure

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Mobile Handset Share by Vendor

Mobile Handset Shipment Based Vendor Share  [2011.2Q (April to June)]

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Shipment (Million)</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nokia</td>
<td>88.5</td>
<td>24.7%</td>
</tr>
<tr>
<td>Samsung</td>
<td>74.0</td>
<td>20.7%</td>
</tr>
<tr>
<td>LG</td>
<td>24.8</td>
<td>6.9%</td>
</tr>
<tr>
<td>Apple</td>
<td>20.3</td>
<td>5.7%</td>
</tr>
<tr>
<td>ZTE</td>
<td>19.6</td>
<td>5.5%</td>
</tr>
<tr>
<td>Huawei</td>
<td>13.9</td>
<td>3.9%</td>
</tr>
<tr>
<td>RIM</td>
<td>12.5</td>
<td>3.5%</td>
</tr>
<tr>
<td>HTC</td>
<td>11.9</td>
<td>3.3%</td>
</tr>
<tr>
<td>Motorola</td>
<td>10.6</td>
<td>3.0%</td>
</tr>
<tr>
<td>Others</td>
<td>81.9</td>
<td>22.8%</td>
</tr>
<tr>
<td>Total</td>
<td>358.0</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Strategy Analytics
Evolution of Mobile Handset
## Evolution of the Cell Phone

<table>
<thead>
<tr>
<th>Year</th>
<th>1st generation</th>
<th>2nd generation</th>
<th>3rd generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>Motorola DynaTAC, Approx. 1kg</td>
<td>Nokia 1011, 495g</td>
<td>Sony Ericsson P800 smartphone, 158g</td>
</tr>
<tr>
<td>1990</td>
<td>Motorola StarTAC, 88g</td>
<td></td>
<td>RIM BlackBerry Quark 6210 smartphone, 136g</td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td>Apple iPhone 3G smartphone, 140g</td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Miniaturize**

**Functionalize, Thin/High Speed**

- Mail, camera, data
- Internet
- Cloud
Characteristic of the 1st Generation

- Period: From 1980s to 2000
- Analog based mobile network
- No data communication, only SMS
- Heavy and bulky handset
- Extremely expensive, starting from $1,000
- “Miniaturize” is the most important for development
- Targeted only for the business and for special segment
Mobile Handset History: 1st Generation

Handset Trend Transition

1983

Motorola DynaTAC 8000X

$3,995

1993

Motorola StarTAC

$1,000

BellSouth/IBM Simon Personal Communicator

$900

Nearby 2 POUNDS

PDA FEATURES

phone | calculator | pager

address book | email device

3.1 OUNCES — small and light

First phone to vibrate

Optional lithium ion battery (previous phones used NiMH batteries)

1996

Nokia 7110

Approx. $475

Nearly 5 OZ.

First mobile phone with WEB BROWSING

Modeled after “THE MATRIX” MOVIE AUTOMATIC OPENING SLIDE

BIGGER SCREEN and better features

1999

Nokia 6160

$900

External antenna, 5.2” TALL

MONOCHROME DISPLAY

MOST-POPULAR MOBILE of the 1990s

Source: GigaOM and Newgrounds.com
Characteristic of the 2\textsuperscript{nd} Generation

- Period: From appx. 2000 to 2007
- Mobile phone for the mass people
- Relatively slow data connection/ Internet usage by phone
- Golden time for handset vendors: handset vendors were the most influential and powerful
- Various kinds of handsets
- Handset development environment is relatively closed
2nd Generation: Handset vendors have the strongest power

2nd Generation: Handset Design Trend Transition

Smaller

High End

Motorola V60: 109g
Nokia 3310: 133g

Low End

Motorola V70: 83g
Nokia 3410: 114g
Nokia 1100: 86g

Multimedia

Motorola RAZR v3: 13.9mm*
NEC L1: 11.9mm*
Motorola V600: 115g*

Design/ Thinner

Samsung SPH-V9900: 6.9mm*
Samsung P520: 8.9mm**
Sharp GX10: 110g*
Motorola V60: 109g
Samsung U100: 5.9mm*
LG Chocolate: 15.2 mm*
LG PRADA phone: 12mm**
Nokia 6310: 111g*
Panasonic A100: 66g:
Samsung P520:

Samsung U100:

Nokia 1100: 86g
Panasonic A100: 66g
VK Mobile: 48g:

 schemas/2020-07-22_18-48-08_diagram.png
"Xelibri" by Simens, was one of the most unique series of handset...

- **Xelibri 5**
  - 74 gram
  - 139 Euro

- **Xelibri 6**
  - Compact type
  - 90 gram
  - 179 Euro

- **Xelibri 7**
  - 83グラム
  - 価格: 179ユーロ（約23,800円）

- **Xelibri 8**
  - Neck less Type
  - NO button (Voice Recognition)
  - 179 Euro
Reference ②: Unique Feature phones

"Qiblah" by LG Electronics, was one of the best selling feature phones by LG for Islamic people.

LG F7100 Qiblah

- Points the direction of MECCA (With the Compass function)
- Make alerts 5 times a day to pray
- Arabic language
- SMS/MMS capability
- LG’s best selling feature phone

* LG’s strategy to cater for the specific needs of the Muslim people

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>89g</td>
</tr>
<tr>
<td>Display</td>
<td>LCD65K Color</td>
</tr>
<tr>
<td>Talking time</td>
<td>210 mim</td>
</tr>
<tr>
<td>Waiting hour</td>
<td>200 hour</td>
</tr>
<tr>
<td>Technology</td>
<td>GSM900/1800/ GPRS</td>
</tr>
</tbody>
</table>

Release date: July, 2004

“Phone for Muslim Community”
Characteristic of the 3rd Generation

- Period: appx. 2007 ~
- Smartphone era
- Higher speed network
- More internet connection
- Many new entrants to mobile handset industry, such as Google and Apple
- Industry structure revolution
Mobile Handset History: 23rd Generation

Beginning of Smartphone Era with iPhone

Year 2007: “iPhone” released

Almost all the high-end handset “look alike” after iPhone
Industry Definition of "Smartphone"

- Open Operation System (OS)
- Specification is disclosed to the third party
- Broad application development environment
- Mobile network capability
  e.g. Not Wi-Fi only handset
- Apple: iOS, Google: Android, RIM: BlackBerry, Nokia: Symbian, Microsoft: Windows Phone (Windows Mobile) and Linux

What is Smartphone?
Smartphone Market Projection

Global

【Unit: Million】

2010年

21.4%

78.6%

2015年

41.0%

59.0%

Data: Strategy Analytics, MCPC

Japan

【単位:100万】

11.1%

88.9%

50.3%

49.7%

Data: Strategy Analytics, MCPC
Smartphone Industry Structure

Smartphone has its own ecosystem

- Smartphone OS providers have strong power.
- “Vertical integration structure”: Smartphone OS provider controls the service, application and even handsets.

<table>
<thead>
<tr>
<th>Service</th>
<th>Network</th>
<th>Application</th>
<th>OS/Platform</th>
<th>Handset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google</td>
<td>Apple</td>
<td>Ovi</td>
<td>BlackBerry</td>
<td>Microsoft</td>
</tr>
<tr>
<td>G M S (Email, Search, Maps...)</td>
<td>iTunes (音楽、映像) MobileMe (データ同期)等</td>
<td>Oviサービス*1 (メール、地図、音楽、映像、ゲーム他)</td>
<td>BlackBerry*2 (法人をコアとしたメールソリューション等)</td>
<td>Live!サービス (検索、メール、写真、データ保存等)</td>
</tr>
<tr>
<td>Network</td>
<td>Application</td>
<td>OS/Platform</td>
<td>Handset</td>
<td></td>
</tr>
<tr>
<td>Android Market</td>
<td>App Store</td>
<td>Symbian/ S40, S60</td>
<td>RIM OS</td>
<td></td>
</tr>
<tr>
<td>Network</td>
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<td></td>
</tr>
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</table>

| Smartphone Market share | 47.7% (17.5%) | 13.5% (13.5%) | 16.9% (42.8%) | 11.4% (17.9%) | 2.4% (4.3%) |

*Smartphone market share: Top line: 2011.2Q, bottom: 2010.2Q
Smartphone OS based handset market share

- Android and iPhone OS are becoming two most powerful players
- Nokia’s Symbian losing much market share

Source: Strategy Analytics
Data Traffic Explosion caused by Smartphone

- AT&T’s iPhone brought huge revenue with the dramatically growing traffic
- However, the carriers worry to become “Dumb Pipe” only providing the network.

AT&T Mobile Data Volumes Up 8,000% Over Four Years

http://www.att.com/Common/about_us/pdf/INV_PRES_3-21-11_FINAL.pdf
Global Mobile Data Traffic Forecast

CAGR (Compound Annual Growth Rate)

Source: Cisco VNI Mobile, 2011

Sauce: Cisco
Smartphone Application Store

• "Application Store" is the place to provides third party developed application and contents

• It makes the mobile industry even much more global

App Store by Apple

Android Market by Google
Variation of Android Smartphone
Mobile Handset Vendor Profit

Year 2007

- Sony Ericsson: 1,091
- Motorola: 820
- LG: 971
- RIM: 754
- HTC: 2,225
- Nokia: 11,381
- Samsung: 2,286
- Apple: 501

In million US dollars

Year 2010

- Sony Ericsson: -198
- Motorola: -607
- LG: 2,718
- RIM: 4,710
- HTC: 1,446
- Nokia: 3,779
- Samsung: 9,356
- Apple: 227

In million US dollars

Source: Strategy Analytics. Exchange rate as of August 2011 for both charts.
Analysis of the Mobile Phone Evolution

~ What are the futures phone like?
### What the Future Mobile Handset Be Like?

<table>
<thead>
<tr>
<th>Network</th>
<th>1st Generation</th>
<th>2nd Generation</th>
<th>3rd Generation</th>
<th>Next Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network</td>
<td>Analog</td>
<td>Digital</td>
<td>W-CDMA (UMTS)</td>
<td>4G/ LTE</td>
</tr>
<tr>
<td>Data/Internet</td>
<td>Extremely limited</td>
<td>Limited</td>
<td>More internet use, congested</td>
<td>Cloud computing</td>
</tr>
<tr>
<td>Function</td>
<td>Voice, SMS only</td>
<td>Multimedia capability</td>
<td>Application, PC like function</td>
<td>Getting huge</td>
</tr>
<tr>
<td>Handset Category</td>
<td>Basic Phones</td>
<td>Feature Phones</td>
<td>Smartphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No device intelligence</td>
<td>Low device intelligence</td>
<td>High device intelligence</td>
<td></td>
</tr>
</tbody>
</table>

**Handset itself getting more intelligent**

- Cloud computing
- Handset commoditization

*What do you think???
The 4th Generation Handset Factor

- Half of the mobile handset will be smartphone in 2015
- Mobile handsets will be more commoditized and hard to differentiate the terminal itself
- Mobile network will be getting much faster
- More players flooding into mobile industry, such as internet company, SNS, and so on…

What are the future mobile phones and services be like???
Thank You!

InfoCom Research, Inc.

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Chief Consultant

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