



➤ MOBILE HANDSET USE IN DFS

ITU-T FOCUS GROUP ON DIGITAL FINANCIAL SERVICES



International Telecommunication Union

ITU-T

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Mobile Handset Use in Digital Financial Services

Focus Group Technical Report

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Mobile Handset Use in Digital Financial Services

About this Report

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The author would like to thank members of the Technology, Innovation and Competition Working Group of the Focus Group Digital Financial Services for their constructive comments on drafts of this report.

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Table of contents

1	Overview	8
2	Phone types	9
3	Phone statistics	10
4	Taxation and handsets	11
5	DFS and phone features	11
6	Phone models available in emerging markets	12
7	Conclusion	14

List of abbreviations and acronyms

2G	Second Generation Mobile
3G	Third Generation Mobile
3GPP	Third Generation Partnership Project
4G	Fourth Generation Mobile
AMOLED	Active Matrix OLED
DFS	Digital Financial Services
EDGE	Enhanced Data for Global Evolution
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
GSMA	GSM Association
HSPA	High Speed Packet Access
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
J2ME	Java 2 Platform, Micro Edition
LCD	Liquid Crystal Display
LTE	Long Term Evolution
M2M	Machine to Machine
MNO	Mobile Network Operator
NFC	Near Field Communication
NS	Non-Standard
OTA	Over The Air
OTT	Over The Top
P2P	Person-to-Person
RAM	Random Access Memory
SE	Secure Element
SEP	Standard Essential Patents
SMS	Short Message Service
SOC	System-on-a-Chip
SP	Service Provider
STK	SIM Toolkit
TFT	Thin Film Transistors
UI	User Interface
USSD	Unstructured Supplementary Service Data
UX	User Experience
VAS	Value Added Services
WAP	Wireless Application Protocol

1 Overview¹

The mobile phone evolution over the past few years has, to some extent, blurred the previously distinct lines between the “traditional” device categories namely, basic phones, feature phones and smartphones.

While the developed world moves rapidly past a feature phone era to a smartphone-centric era, countries in the DFS markets still maintain significant use of basic and feature phones. The predominant types of mobile handsets in DFS markets, serving those at the bottom of the pyramid (BOP), are basic phones and feature phones. Some DFS markets are showing increases in smartphone penetration. The GSMA estimates that while basic and feature phones are currently around 50% of developing world markets, by 2020 the percentage of these connections will drop to 30%.²

Mobile phone prices in 2016 have dropped significantly across all handset categories in spite of the fact that subsidies from mobile network operators are largely falling away:³

- The cheapest basic phone found was the Kaliho K204 at US\$4;
- The cheapest feature phone found was the Vitel 105 at US\$7; and
- The cheapest smartphone found was the Micromax Bolt A24 at US\$33.

These price drops are largely due to the expiry of early mobile phone and GSM network technology patents and the introduction of all-in-one ‘System-on-a-Chip’ (SOC) technology where the major components of a phone have been squeezed onto a single chip. This has led to a flood of cheap phones and connected tablets from new manufacturers.

While a number of new and emerging brands such as Tecno and Oppo, are gaining market share in emerging markets, Samsung at 17%, dominated handset ownership in many African markets during 2016. BlackBerry penetration, which has held steady at 6% penetration, is expected to rise to 16% in 2017.⁴

¹ Data in this study from Perlman, L (2010) *Mobile Money*, Mobile Money Conference at Columbia Business School; Perlman, L (2012) *Legal and Regulatory Aspects of Mobile Financial Services*; Perlman, L (2015a) *Security Issues in Digital Financial Services*; Perlman, L (2015b) *Technologies Used in Mobile Financial Services*, Perlman, L (2016a) *Risks in Digital Financial Services*; and Perlman, L (2016b) *CFI/Accion: Access at The Frontier* (working title)

² GSMA (2015) *ibid*

³ Local and import taxes may increase street pricing.

⁴ IT News Africa (2016) *Study reveals African mobile phone usage stats*, available at: <http://www.itnewsafrika.com/2015/04/study-reveals-african-mobile-phone-usage-stats/>

2 Phone types

Basic phones – also called ‘low-end’ phones - are devices with limited feature sets, limited or no factory-installed or user-installable value added third party applications, and no or very limited data connectivity.

The ‘basic’- or ‘low-end’ - appellation is a throwback to the early days of the emergence of GSM mobile technology, where only basic functionality - such as call functions, SMS, USSD v1 functionality, and a phonebook - were needed (and available) to communicate.

These device types can, however, for the most part, access DFS platforms through use of basic Unstructured Supplementary Service Data (USSD) and SIM Toolkit (STK) feature sets.

Poor power output and antenna design in some of these devices may reduce the user experience. While feature phones with more connectivity options are replacing basic phones worldwide,

Feature phones are a midway design point in phone functionality. They are the most common phone type worldwide: in the developing world, basic and feature phones make up around 70% of the phones used.⁵ They have small non-touch displays of median size of 2.7”. They have limited functionality and proprietary operating systems designed by either the manufacturer of the phone, or as part of an operating system designed by the primary component maker.

Most produced after 2008 have Bluetooth, WAP-based phone browsers, and (in many cases) an ability to install and run Java applets and applications, a camera, and primarily use narrowband 2G EDGE/EDGE+ speeds for mobile data access. Only a few feature phones produced since 2014 support 3G (or 4G) and their variants. This is to reduce the price point for the devices. Very few support NFC.

Smartphones offer a better user interface than used on basic and feature phones, as well as providing more bouquets of service offerings, for example agent mapping data. Entry-level smartphones being sold in emerging markets are at feature phone-level pricing of around US\$30,⁶ although many are low-end varieties running older versions of Google’s Android mobile phone operating system⁷ and may not have 3G capabilities to save on costs.⁸



Exhibit 1:
Kalibro
K204
Basic
phone at
US\$4



Exhibit 2:
Vitel 105
feature
phone at
US7.

⁵ GSMA (2015) *From Feature Phones to Smartphones, The Road Ahead*, available at: <https://www.gsmaintelligence.com/research/2015/01/from-feature-phones-to-smartphones-the-road-ahead/456/>

⁶ Plus any local taxes.

⁷ GSMA (2015) *ibid*

⁸ See further Perlman (2016) *ibid*. Handset manufacturers usually pay royalties for certain declared-essential patents for cellular and other standards. However, recent estimations by Galetovic and Haber are that there could be high evasion of payment by especially feature phone manufacturers. See Galetovic, A and Haber, S (2016) *A New Dataset On Mobile Phone Patent License Royalties*, available at <http://hooverip2.org/wp-content/uploads/ip2-wp16011-paper.pdf>

Lower and mid-range smartphones also use lower quality, high battery consumption displays, while higher end devices use power-sipping and higher-resolution displays.⁹

3 Phone statistics

Smartphones are growing in penetration, but are not yet the plurality in the developing world. Adoption in the East African Community (EAC) is 17%, and 24% in the Southern African Development Community (SADC).

Feature phone use is higher in urban areas than rural areas. South Africa and Nigeria, markets characterized by significant levels of urbanization and competition, there is better supply chain capabilities for rural markets, which has led to increases in smartphone penetration in these areas.¹⁰ In Zimbabwe, smartphones dominate urban markets, with feature phones the plurality in rural areas.¹¹

GSMA statistics for Asia-Pacific show an almost even split between smartphones and basic/feature phones of 45% to 41%, and estimating that by 2020, smartphones will be 65% of these market.¹²

However, manufacturing data indicates persistent increases in production of critical feature phone components, which means that reduction in feature phone penetration predicated by analysts is likely to be delayed well beyond 2020. Indeed, large DFS markets such as India are seeing a large increase in feature phone production by local manufacturers and increases in import by others.¹³ Smartphone sales growth was in India was an average 8% during the course of 2016, down from a spirited growth of 29% in 2015.¹⁴

Globally, the flat – and sometimes decreased – growth in smartphone penetration could be due to saturation of smartphones in its core base of urban areas, and increase in DFS in rural areas where feature phones still predominate because of user preferences by low income users for features such as device durability, low retail cost, good speakerphones and week(s)-long battery life.¹⁵ Notably, these features are however difficult to achieve (even) with low-end smartphones, such that the average lifetime of use of a feature phone has risen to 490 days, up from 470 days.¹⁶



Exhibit 5:
Micromax Bolt A24, a 2.8” Android phone at US\$33 in India

⁹ Usually thin, Active Matrix OLED displays.

¹⁰ Deloitte (2016) *Game of Phones: Deloitte’s Mobile Consumer Survey. The Africa Cut 2015/2016*, available at https://www2.deloitte.com/content/dam/Deloitte/za/Documents/technology-media-telecommunications/ZA_Deloitte-Mobile-consumer-survey-Africa-300816.pdf

¹¹ *ibid*

¹² GSMA (2016a) *The Mobile Economy – Asia Pacific 2016*, available at: <http://www.gsma.com/mobileeconomy/asiapacific/>

¹³ As noted in the India Times, India’s second largest handset maker, Intex Technologies shipped 3 million feature phones in January-March 2015, 5.4 million in the third quarter of 2015, and 4.4 million units by the end of March 2016, nearly double its smartphone production. India Times (2016) *Smartphone Sales Drop, Users Await Affordable Options*, available at <http://ecoti.in/nVfcJY>

¹⁴ Indian Times (2016) *Feature Phones Will Continue Dominating Indian Markets In 2016*, available at <http://ecoti.in/aFWLta>

¹⁵ India Times (2016) *ibid*

¹⁶ *ibid*. Primarily in India, but this appears to be a global trend.

4 Taxation and handsets

Prices for phones and access may however be effected by the increased tendency by some regulators to tax mobile phone imports and mobile phone airtime. In July 2015 for example, handset prices increased after the federal government doubled the general sales tax on all types of imported mobile phones.¹⁷ Similarly, Ghana imposed a 20% duty on handset imports for a total of 24.5% of the cost of mobile ownership, a tax burden almost as high as that on wines and spirits.¹⁸ The Jordanian government imposed a 45% tax on mobile airtime.

While tax increases on mobile handsets appear to be a general trend, the Indian government bucked the trend by cutting import tariffs on handsets from 29.5% to 12.5%.¹⁹ For many in the mobile industry, high import duties and local taxes are seen as counterproductive since they encourage the dominance of feature phones and encourage smuggling of devices, leading to total loss of customs revenue.²⁰

5 DFS and phone features

DFS platform vendors and SPs cater towards the access mechanism characteristic of their markets. Thus DFS customers in the developed world - who typically use 3G smartphones - access DFS using mobile payment and banking apps, whilst in the developing world, users - who typically use basic/feature phones - access DFS via narrowband, primarily text-based user interface access mechanisms such as USSD, STK, and WAP.

For the most part, feature phones can run STK ‘applications’ that provide secure access to DFS platforms such as m-Pesa in Kenya. Some but not all can run Java applications through the J2ME²¹ software environment.²² Poor user interfaces on basic and feature phones using USSD and STK may prolong the use of OTC DFS activities and stunt DFS account usage.

There are some technical limitations with entry-level smartphones, with poor display quality and durability, some without 3G/4G, and poor battery life. A further complicating factor is that in many markets, 3G and higher mobile data coverage is limited to mostly urban areas and along national roads, which could affect user experience, especially with DFS apps features that require higher bandwidth.

A major issue is that because of design changes across the various Android versions, not all DFS apps will be usable across all Android versions. This could mean that the latest version of a DFS

¹⁷ Express Tribune (2015) *100% increase in tax on mobile handsets*, available at: <http://tribune.com.pk/story/898747/100-increase-in-tax-on-mobile-handsets/>

¹⁸ Deloitte (2016) *Digital Inclusion And Mobile Sector Taxation In Ghana*, available at: http://www.gsma.com/publicpolicy/wp-content/uploads/2016/09/GSMA2015_Report_DigitalInclusionAndMobileSectorTaxationInGhana.pdf

¹⁹ BGR (2016) *Government Rolls Back 29.44% Import Duty On Mobile Phone Components*, available at: <http://www.bgr.in/news/government-rolls-back-29-44-import-duty-on-mobile-phone-components/>

²⁰ See CITIFM (2016) *Telecom Analyst Demands Tax Cuts On Imported Phones*, available at <https://shar.es/1D8vJW>

²¹ J2ME (Java 2 Platform, Micro Edition) is a technology developed by Oracle.

²² This is still not ubiquitous since not all chipsets support J2ME

app may not work on an older Android phone version.²³ The size of the newest DFS apps also touch the upper limit of available storage space on lower-end smartphone devices.²⁴ Of concern too is the large and growing market of counterfeit and illegal phones, many of which are being tracked and then barred from mobile network access by telecommunications regulators and MNOs.²⁵

6 Phone models available in emerging markets

See Exhibit 6.

²³ As of December 2016, Android was at version 7.1. Specifically, smartphones using the older Android version 2.3 OS will soon no longer be supported by many app makers. See Android Developers (2016) *Backwards Compatibility*, available at: <https://developer.android.com/design/patterns/compatibility.html>

²⁴ *ibid*

²⁵ As an example, the Tanzania Communication Regulatory Authority in June 2016 blocked 1.82 million counterfeit phones. For a comprehensive overview, see Perlman (2016) *ibid*.

Brand	Model	Type	SIM	Network	Data	Screen (inches)	Camera	Battery (mAh)	Country	Java	Bluetooth	SD	Year	Price (US\$)
Kaliho	K204	B	D	G	2G	1.8	N	500	CH	N	Y	Y	2016	4
Vitel	105	F	D	G	2G	2.9	Y	1000	IN	Y	Y	Y	2016	8.75
Micromax	X1850	F	D	G	2G	1.77	Y	1800	IN	N	Y	Y	2015	12.60
KZG	G95	F	D	G	2G	2.4	Y	1200	RW	N	Y	Y	2015	13.76
Fero	240	F	D	G/C	2G	2.4	Y	1800	UG	N	N	Y	2016	14.30
Haier	M311	F	D	G	2.5G	2.4	Y	1000	IN	N	Y	Y	2016	14.91
Micromax	X805	F	D	G	2G	2.8	Y	1800	IN	N	Y	Y	2015	17.90
mi-Fone	211	F	D	G	2.5G	2.4	Y	2800	KE	N	N	Y	2015	18.41
Tecno	T347	F	D	G	2G	1.7	Y	1150	NG	Y	N	N	2015	18.44
Intex	Jazz 2	F	D	G	2.5G	2.4	Y	1800	IN	N	Y	Y	2016	18.64
Symphony	M90	F	D	G	2G	2.4	Y	1700	BD	N	Y	Y	2015	21.12
Micromax	X879	F	D	G	2.5G	2.8	Y	1500	IN	N	Y	Y	2016	21.63
Lava	KKT	F	D	G	2G	2.8	Y	2000	BD	N	Y	Y	2015	21.75
Haier	M105	F	D	G	2.5G	2.4	Y	1450	PK	N	Y	Y	2015	23.19
Nokia	1100	B	S	G	2G	2	N	850	BD	N	N	N	2003	23.75
Nokia	2300	B	S	G	2G	2	N	850	BD	N	N	N	2003	25.61
BLU	Z3	F	D	G	2.5G	1.8	Y	600	BR	N	Y	Y	2015	26.16
Samsung	Guru Plus	F	D	G	2G	1.5	N	800	IN	N	N	N	2015	31.78
Samsung	E1272	F	D	G	2G	1.77	N	800	PH	N	N	N	2013	32.14
Micromax	Bolt A24	Sm	D	G/E	2G	2.8	Y	2000	IN	Y	Y	Y	2014	33.00
Nokia 215	215	F	D	G/E	2G	2.4	Y	1100	IN	N	Y	Y	2015	33.00
BLU	Jenny TV 2.8	F	D	G	2G	2.8	Y	820	BR	N	Y	Y	2013	33.64
Lava	Iris 505	Sm	D	G/H	3G	5	Y	2000	BD	N	Y	Y	2013	36.80
Lava	Iris Style	Sm	D	G/E	2G	3.5	Y	1400	IN	N	Y	Y	2015	40.00
Nokia	215	F	D	G	2G	2.4	Y	1100	ZA	N	Y	Y	2015	44.89
LG	A395	F	Q	G	2G	2.2	Y	1500	GH	Y	Y	Y	2013	45.43
Nokia	220	F	S	G	2.5G	2.4	Y	1100	IN	N	Y	Y	2014	49.30
Alcatel	Pixi 3	S	D	G/P	3G	3.5	Y	1300	IN	N	Y	Y	2015	50.00
Alcatel	10.16G	F	S	G	2.5G	1.8	N	400	US	N	N	N	2015	52.83
Samsung	Metro 312	F	D	G	2G	2	Y	1000	IN	Y	Y	Y	2014	57.22

Brand	Model	Type	SIM	Network	Data	Screen (inches)	Camera	Battery (mAh)	Country	Java	Bluetooth	SD	Year	Price (US\$)
Fero	V501	Sm	D	G/W	3G	5	Y	2100	RW	N	Y	Y	2016	62.10
TecN	W3	Sm	D	G/P	3G	5	Y	2500	NG	Y	Y	Y	2016	67.30
Nokia	301	F	D	G/H	3G	2.4	Y	1200	US	Y	N	Y	2013	72.00
BLU	Neo 4.5	Sm	D	G/H	3G	3.5	Y	1800	CO	N	Y	Y	2014	96.64
LG	G360	F	D	G	2G	3	Y	950	US	Y	Y	Y	2015	99.99
Nokia	Lumia 530	Sm	D	G/H	3G	4	Y	1430	US	N	Y	Y	2014	99.99
Konka	W970	Sm	D	G/P	3G	4.5	Y	1800	RW	Y	Y	Y	2013	148.78
Micromax	Nitro 2	Sm	D	G/H	3G	5	Y	2400	BD	N	Y	Y	2015	173.71
Samsung	Galaxy S5	Sm	S	G//H/L	4G	5.1	Y	2800	US	N	Y	Y	2014	179.75
Meizu	m3e	Sm	D	G/H/L	4G	5.5	Y	3100	CM	N	Y	Y	2016	210.63
Samsung	Xcover 550	F		G/H	3G	2.4	Y	1300	IN	Y	Y	Y	2015	270
LG	V10	Sm	S	G//H//L	4G	5.7	Y	3000	US	N	Y	Y	2015	349.99
Hisense	X1	Sm	S	G/W/L	4G	6.8	Y	3900	ZA	N	Y	Y	2014	412.01

Exhibit 6: Sample of the mobile phone models and types available in emerging markets where DFS is available. The cheapest basic phone was the Kaliho K204 at US\$4. The cheapest feature phone found was the Vitel 105 at US\$8.75. The cheapest smartphone found was the Micromax Bolt A24 at US\$33. **Key:** B = Basic; C = CDMA; D = Dual; F = Feature; G = GSM; H = HSPA; L = LTE; N = No; P = HSDPA; Q = Quad; S = Single; Sm = Smart; Y = Yes

7 Conclusion

- User preferences have shifted from basic phones to feature phones, moving towards smartphone use, all of which are driven by a swathe of new manufacturers taking advantage of massive improvements in System-On-A-Chip fabrication and expiry of key patents.
 - Recent manufacturing data shows increases in feature phone component production. Similarly, in key DFS markets, smartphone growth has flattened. Movement towards smartphones however is glacial.
 - OTC activity will persist as long as poor user interfaces such as USSD and STK exist.
 - Basic phones do not support IP-based data connectivity.
 - The vast majority of feature phones do not support IP-based 3G (or 4G) and their variants. Most only support narrowband 2.5G speeds.
 - Smartphones will provide an enhanced User Interface and User Experience for customers, providing access to a range of external DFS services. However, this benefit may be buffeted because many of the devices currently being seeded into DFS markets are of low specification.
 - Because not all MNOs have 3G coverage overlaid over their 2G coverage, the user interface for use of applications that are bandwidth-heavy will be negatively affected.
 - Smartphone penetration will increase when a trifecta of supporting conditions emerge, that is when:
 - Devices improve in quality, particularly battery life and display resolution and robustness;
 - National 3G coverage matches that of 2G coverage, allowing improved user experience; and
 - Device prices drop to feature phone levels.
-