Evolution Pattern of Mobile Phones – A Historical Study

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***Abstract*—**Mobile Phones have emerged as one of the fastest diffusing mediums on the planet, fueling an emergent "mobile youth culture" that speaks as much with thumbs as it does with tongues. Mobile phones have become a crucial part of our daily life nowadays. Everyone – from teenagers to old men – has a personal cell phone of their own. But the mobile phones we see now didn't look like this earlier, instead they were something totally different, something you wouldn't even think of having around you or using. Improved technology has made a great change in the history of mobile phones, transforming the huge brick-like mobile phones of 1995 to sleek and stylish smart phones we carry with us now. This Study attempts to take a ride back to the past and look at how cell phones developed from the bulky walkie-talkie look to today's swipe-savvy descendants. Changing pattern of mobile phones at too much fastest rate is the main issue of the study. Study is too much important as every second person wish to change their mobile phones as early as they can.

***Keywords*—**Cellular Phones; Evolution Pattern; Swipe-Savvy; Technology; Walkie-Talkie.

***Abbreviations*—**Liquid-Crystal Display (LCD); Long Term Evolution (LTE); Return on Investment (ROI); Universal Mobile Telecommunications System (UMTS); User Interface Quartz (UIQ); Video Graphics Array (VGA).

I. INTRODUCTION

THERE was the time when the cell-phones didn't exist. It was in the early '80s that the first mobile phone came about. Previous 'wireless communication systems' were too bulky to be called mobile — although many did exist for military and civilian use. The first generation of cell-phones did nothing except calls — and that too for about 30 minutes; it was all that the battery in those days allowed [Blair et al., 1]. The next few generations were fondly called 'bricks'— not just for their appearance but also because they could come in handy as a blunt weapon if needed. Between the '80s and '90s, devices kept evolving and getting more popular. In India, the first commercial cell-phone and service launch was in July 1995 — so we were quite a few years behind at the time. It was a partnership between the Modi Group and Australian telecom operator Telstra that brought the first cellular network to India.

The turning point in India for the cell-phone would be some time in 1998. That was around the time when networks really expanded [Tamyra Pierce, 2], cell-phones became increasingly popular, and the call rates became a little less ludicrous. Pre-1998, only the richest people owned one and most of them hardly used it. Some, deterred by local call rates that went as high as Rs 60 per minute, kept them away in drawers. There was no second-hand market for cell-phones in those days. The year 1998 was also when Nokia launched the indestructible and utterly desirable 5110. Almost everyone had one or wanted one.

The Nokia 5110 was ultra-durable, had user interchangeable covers, a stubby antenna, great battery life, crystal-clear call quality, a clear LCD screen and it popularized the game that we all know as 'Snake'. Importantly, this was the time when local call rates from a mobile phone were in the region of Rs 12 to Rs 18 per minute. Incoming calls were still not free at this point.

The Nokia 5110 was and is one of the most beautiful pieces of handheld technology ever created. It was fairly slim, lightweight, felt good in the hand, had stellar build quality and was a great first step into the world of mobile telephony. It powered on in precisely five seconds (unheard of today, in the age of smart phones) and had a standby time of a few days. The mono LCD was clear and legible under any lighting conditions. The battery was external — meaning that no cover needed to be removed to replace the battery; the battery formed part of the back cover itself. Other components like the antenna stub, front fascia (faceplate) and rubber keypad were user replaceable. This was also the device that spawned a whole new industry — that of the 'duplicate' or after-market front fascia.

Since original Nokia replacement faceplates were expensive and available in a limited number of sober colors, the market quickly adapted to bring out zany colors, different

finishes and custom designs. It was the precursor to the customized cell phone accessories of today.

Post the 5110, cell phones kept getting sleeker (with internal antennas!) and smaller. The term 'upgrade cycles' would have been alien to many, but it was two years later, in 2000, that the Nokia 3310 was launched — this writer's second phone. Compared to the 5110, it was smaller, lighter and had no external antenna.

This time, though, the entire phone was in a replaceable shell — it had a removable front and back plate. The fact that it was essentially the same as the 5110 didn't matter —the powerful design was a big draw. When your phone got scuffed and the screen got scratched, you could just buy a new casing without altering the actual screen, keypad or internal components — the aftermarket options for casings were aplenty and cheap. There was never a need for screen protector or cases — and they didn't exist.

Barely a year later in 2001, the world was introduced to the concept of cell phones with tiny, color screens. It was as big a deal as was the introduction of the first color television in the early '80s. It was akin to having a tiny color TV in your hand — it was such a powerful motivator that it had to be acquired. This writer got the Panasonic GD68 and it was amazing [Lei Tian et al., 3]. Whatever it cost was worth it just to see the look on people's faces when they saw the tiny parrots on the screen in glorious 256 colors, 101x80 pixel resolution.

A Nokia 7650 was this writer's first smart phone, purchased in 2002 — it was a Symbian Series 60 phone, capable of several smart features like adding apps, sharing and Bluetooth. In the next three years, there was a long string of Symbian phones that followed: the Nokia 3660, 6600, N73 and N95. This writer's first brush with touch phones was the Symbian UIQ-powered Sony Ericsson P910. It had a conventional keypad, QWERTY keypad and touch screen which you could use with a finger or stylus. Today, practically everyone has moved on to precise, beautiful and fast touch screen phones [Shari Walsh et al., 4]. Who knows what the next major evolution in cell phones will be.

As cell phone technology continues its rapid development, the device appears capable of contributing to student learning and improved academic performance. For example, modern "smartphones" provide students with immediate, portable access to many of the same education-enhancing capabilities as an Internet-connected computer, such as online information retrieval, file sharing, and interacting with professors and fellow students [Bull & McCormick, 5]

II. Objectives of the Study

Primary Objective: To study different types of Mobile phones available from their beginning to present time in the market.

Secondary Objective: To study evolution pattern of Mobile phones year after year.

III. Literature Survey

There exist a number of papers and articles on evolution of mobile phones pattern. But, still no study has been made to combine all in one place and to the current year 2016. This section reviews some of the previous studies available. One of the earliest papers on cell phones examined it through the lens of gender; in 1993, Lana Rakow and Vija Navarro wrote about the cell phone and what they called "remote mothering" [6].

Mobile phone usage has proliferated in recent years. Some areas of the world have enjoyed rapid deployment and high penetration of mobile telephony. 70% of the world's population own at least one mobile phone. Based on the statistics, children in United States now are more likely to own a mobile phone than a book, with 85% of kids owning a phone as to only 73% owning books [6].

Most of the mobile phones nowadays are addressed as 'smartphone', as they offer more advanced computing power and connectivity than a contemporary mobile phone. Along with the smartphone fundamental capabilities to make voice call, video call, SMS, and MMS, smartphones have been repositioned as a "new information medium" [May & Hearn, 7].

Smartphones have the extended information processing functionalities such as managing personal time schedule, accessing Internet contents, editing documents, utilizing location-awareness function, and many other exciting applications. Nonetheless, no matter how smart the smartphone is; it will not result in expected benefits and effectiveness, if they are not being utilized [Agarwal & Prasad, 8].

The first handheld mobile cell phone was demonstrated by Motorola in 1973. The first commercial automated cellular network was launched in Japan by Nippon Telegraph and Telephone in 1979. This was followed in 1981 by the simultaneous launch of the Nordic Mobile Telephone (NMT) system in Denmark, Finland, Norway and Sweden [9]. Several other countries then followed in the early to mid-1980s. These first-generation (1G) systems could support far more simultaneous calls, but still used analog technology.

In 1991, the second-generation (2G) digital cellular technology was launched in Finland by Radiolinja on the GSM standard. This sparked competition in the sector as the new operators challenged the incumbent 1G network operators.

Ten years later, in 2001, the third generation (3G) was launched in Japan by NTT DoCoMo on the WCDMA standard [10]. This was followed by 3.5G, 3G+ or turbo 3G enhancements based on the high-speed packet access (HSPA) family, allowing UMTS networks to have higher data transfer speeds and capacity.

By 2009, it had become clear that, at some point, 3G networks would be overwhelmed by the growth of bandwidth-intensive applications, such as streaming media. [Fahd Ahmad Saeed, 11]. Consequently, the industry began looking to data-optimized fourth-generation technologies,

with the promise of speed improvements up to ten-fold over existing 3G technologies.

In the book "Mobile Advertising: Supercharge your brand in the exploding wireless market," authors postulated that mobile is the most important advertising medium because it helps close the loop from an impression and first sight to transaction and spend [Herzog Sharma & John Melfi, 12].

To say that mobile devices have become a remote control of our lives is a cliché but it is very true. It is not just traditional phones that have a cellular connection these days. We are slowly but surely moving into an era where a majority of electronic devices from small tags to giant billboards will have a communication channel that both machines and humans can interact with [Chetan Sharma, 13].

IV. RESEARCH METHODOLOGY

Research Design:

Historical research design

Data Collection:

Secondary data through websites and research papers available on Internet.

Data Analysis & Interpretation:

Evolution of mobile phones analyzed through a comparative table.

Interpretation has done through analytical skills.

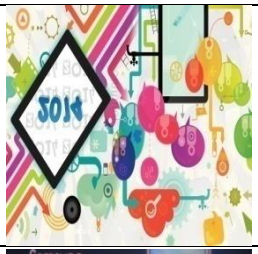
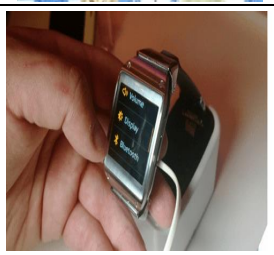
4.1. Evolution Pattern of Mobile Phones

Tests began in the Baltimore/DC area in 1981. The first commercial service began in 1983 with the advent of the legendary Motorola DynaTAC 8000X. In 1984 Bell Labs perfected the modern system of cellular telephony that we use today. Thus began first generation analog cellular telephony (1G), though we didn't call it that at the time. Global System for Mobile Communications (GSM) began in Finland in 1991. 2G introduced in the 90s, it was characterized by digital technology and out of band signaling. 2G also introduced texting – the first text (SMS) messages were sent in Finland in 1993. Finland was also the site of the first digital content delivered to cell phones besides texts – ringtones and advertising [John F. Clark, 14].

Sr. No.	Year	Features	Looks
1	1995	Huge in size with pretty long antenna, similar to today's cordless phone. It must seem real odd to us now, but back then this cell phone were the craze of the day.	
2	1996	Antennas were shortened and the designs modified; the features were also upgraded. Image shows Nokia 9000 which was one of the most popular phones of that time.	
3	1997	Antennas vanished from the mobile phones, giving an improved look than how it was before. This enhancement also saved space and marked the introduction of internal antennas in the mobile phones. Image shows a typical cell phone of 1997 from Telco AT&T.	
4	1998	Though antennas were removed from most of the mobile phones, there are still some of them who retained antennas and changed the typical color of black to vibrant colored cases instead. Image shows Nokia 5110 which was launched in 1998 and was available in a variety of colors to choose from.	
5	1999	Mobile phones were given a more compact look. Image shows a Nokia 3210, features cool colors, internal antenna and better graphics in a much smaller package than previous phones.	

6	2000	The world's first touch screen phone came out. Although it didn't have advanced touch screen technology like those available today, but at that time it was a huge craze and the introduction of a promising technology. The image shows a Motorola phone which has a simple black and white touch screen, allowing easier access to various features than before.	
7	2001	2001 was the birth year of the world's first monochromatic display cell phone, and with that we wave goodbye to the old and boring black display. The image shows a Nokia 8250, which had a single color display, for example the background was not the same grey background anymore, it had backgrounds of different colors like blue, which along with the compact design made this phone a great choice for everyone.	
8	2002	In 2002, technology made another huge change in the history of mobile phones, putting a great full color display and integrating camera to mobile phones, producing the world's first camera cell phone. The Nokia 7650 shown here is on sliding mode features a great color display and a 0.3MP camera allowing you to snap pictures on the move.	
9	2003	In 2003, the clam shell phone very much like the Samsung S300 above was introduced. Mobile phones are no longer limited to single screen. This model has a small screen on the outside to notify calls and text messages coming in, and a big screen on the inner for the user to type messages and carry out other functions of the phone.	
10	2004	2004 gave rise to the one of the slimmest cell phone of the time, created by Motorola. The above image shows a Motorola V3, which was in a class of its own, bearing stunning looks, a slim shape, dual screen, VGA Camera and lots of other exciting features. Mobile phones have come a long way from brick-like bulky to stylish sleek that can fit in your shirt pocket. Surely we've reached the pinnacle of cell phone evolution, right?	
11	2005	In 2005, Sony unveiled the world's first Walkman phone, and W800i was truly an awesome phone definitive of the series. The Sony W800i shown here was built for delivering great music and with dedicated buttons for music playback, Memory Stick support, which made it a great gadget for enjoying music anytime on the go. And it still serves all the main purpose of a cell phone.	
12	2006	In 2006, mobile phones were transforming with into a stylish gadget. It began its new role as an accessory to mark the personality of the owner, to make a statement of what defines one's preferences, likes and dislikes. The LG Chocolate was a great example of how cell phone designers are putting style in the forefront of cell phone design.	

13	2007	In 2007, Apple Inc unveiled the Apple iPhone, which was the world's first advanced touch screen Smartphone. It's the first phone to have an operating system, the iOS, and by enabling apps to run on the phone, it had allowed cell phones to become the primary mobile device of use. Having an iPhone became a source of pride.	
13	2008	In 2008, as dependence on the laptop as a necessary tool for work increase, mobile phones undergo transformation to become the device to have with you on-the-go. The HTC G1, which was a slider cell phone that hides a full QWERTY keypad beneath its large screen, runs on the Android OS.	
14	2009	In 2009, mobile phones can still fit in your palm but the screens get bigger and bear higher resolutions for high performance display. The Motorola Milestone carries a large touch screen, full QWERTY Keypad and ran on Android OS, delivering advanced features to work with.	
15	2010	In 2010, mobile phones were transformed into something like this. Have you ever imagined that you could see this kind of cell phone evolving from the typical brick type heavy phones in the past? The above image shows a Motorola back-flip, which featured a new kind of form, allowing the user to flip the screen on the back of the phone for easy working, as shown above.	
16	2011	2011 marked the return of the touch-screen which dominated the mobile gadget scene with its powerful hardware and sleek looks. The image shows a Samsung Galaxy S II, which has just about all the things that a cell phone and its owner needs in this modern age. It has an 8MP camera and AMOLED Display, runs on the Android OS, is less than 1 cm thick, supports web browsing, calls and has an in-built GPS. This was the phone to beat in 2011.	
17	2012	In 2012, we have the Nokia Lumia 800, which runs on the Windows 7 Mobile Edition OS. No one could have imagined that in a mere 17 years, mobile phones could have made the leap from just being the alternative to landlines to becoming a computer, GPS, radio and our lifeline to the Internet, and still be able to fit in your pocket.	 
18	2013	Apple is now the gold standard in the smart-phone wars—literally so, with its introduction of the gold version of the iPhone 5S. Yet Apple has proven the exception to a general rule this year, which is that mobile devices have been getting cheaper.	

19	2014	2014 will see new metrics with a clear focus on generating ROI based positive campaigns. New metrics such as consumer lifetime value and average revenue per user are evolving and these will be analyzed carefully in accordance with the business model of the app.	
20	2015	Volume sales of mobile phones declined by 14% in 2015, due to a steep decline in sales of feature phones. Consumers preferred to have a smartphone than a feature phone to watch multimedia content and connect to the internet. Mobile phones recorded a lower decline of 8% in current terms in 2015, which was due to sales growth of more-expensive smartphones.	
21	2016	The first mass market smart watches hit the market this year—the Galaxy Gear, the Pebble and the Qualcomm Toq. Google Glass—Google's Internet-connected goggles—has been stirring up interest all year even though only a few thousand people have had access to the units. Fitness trackers like the Nike Fuel Band and Fit Bit were a hit among regular consumers this year.	

V. FINDINGS OF THE STUDY

Mobile phones have evolved a lot in terms of their form, performance and features, and will continue to evolve more and more in the future. In 1996, mobile phones became a little more defined and better looking than how they were before.

In the past two decades, cell phones went from being an object of luxury to a common possession. Initially, cell phones were large, cumbersome, and extremely expensive. Today they are tiny, accessible, and extremely affordable devices. Cell phones are continuing to evolve, and society keeps progressing with them. Today, cell phones are a necessity for teens and young adults as they improve people's social lives, increase productivity, and allow for greater access to information on the go.

Cell phones have become incredibly advanced in a relatively short amount of time, and the possibilities for the future are seemingly endless. Evolving mobile technologies deliver great mobile experiences:- [Qualcomm, 15]

1G established seamless mobile connectivity introducing mobile voice services.

2G digital wireless technologies increased voice capacity delivering mobile to the masses.

3G optimized mobile for data enabling mobile broadband services, and is evolving for faster and better connectivity.

4G LTE delivers more capacity for faster and better mobile broadband experiences, and is also expanding in to new frontiers

5G Qualcomm has been at the forefront of this evolution, pushing wireless boundaries to enable the best mobile experiences.

I can't wait to see what's in store for us on the next evolutionary stage of mobile phones.

VI. LIMITATIONS OF THE STUDY

1. Study is based only on past data
2. Study is limited to current year 2016.

VII. CONCLUSION

The study compared the evolution pattern of mobile phones and finds that the change in technology is responsible for change in mobile phones pattern. This paper attempts to have all types of mobile phones as per their evolution pattern till 2016 at one place. Further researchers can take major help in their studies from this paper. As the technology is changing day by day, study has a vast scope in future to contribute and further research can be done to add the new tech mobile phones. The conclusion is that mobile phones have evolved from brick to current swipe savvy pattern and still more to come in future. It is clear from the study that the next 10 years will see a rapid growth in the way applications and services are built in each vertical segment to reach an ever-expanding mass market and close to 100% penetration by 2020.

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