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- Tesi Graziella Scassillo:
  Analysis Of Product Strategies Across Evolution Of Competences. An Empirical Case Study Of Apple Inc.

- Riassunto tesi

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Analysis Of Product Strategies Across Evolution Of Competences.
An Empirical Case Study Of Apple Inc.

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Introduction

This thesis is dedicated to the analysis of product strategies adopted by one of the most revolutionary companies in the last decades: Apple Inc.

The first chapter will introduce the Company, outlining which are the elements of differentiation that distinguish Apple from the other companies working in the same field. It will be highlighted the indisputable relevance of its founder and former CEO, Steve Jobs, who made Apple a disruptive innovator.

Then an archival and visual research work will follow. It will explain the evolution of Apple products. For each product have been identified its *parents* (in brackets), that are products by which they are influenced the most.

After having done this research study about the products and their characteristics, from 1976 since now, I have deduced some elements of contagion changing during Apple history along the *family tree* of products. The elements taken in consideration have been: user interface, design, colour, portability, screen, processor and manufacturing process.

A paragraph has been dedicated to each of these elements. It will explain how they have evolved overtime. Each characteristic of these elements has been held, changed or selected out, depending on the different strategy adopted over the years.

Furthermore each paragraph outlines the products dramatically changing the most. Products whose characteristics are disruptive and significant for other products in the same timespan will be named *pivot products*. Pivot products represents the moment in which there is a break point in the history of the company. They give birth to features that will be recurring in other products, so they can be seen as *parents*.

Before the third chapter it has been created a timeline chart in which different coloured lines represent the contagion from a product to another.

The third chapter is dedicated to a quantitative method which will highlight the common tendencies across products that have distinguished years of success and at the same time of difficulties. For each element it has been outlined the trend of the level of contagion of the pivot product. The level of contagion results high or low in periods, which respectively present less change in the company choices or a high level of innovation.

Through the analysis of contagion across products will be outlined at the end of this chapter the strategy followed by Apple. This will allow answering to the research question, identifying the different periods experienced by the company. Then there will be some conclusions and personal considerations about the future implications.

Chapter 1

Introduction to Apple Inc. Company. The evolution of competences across products and the elements of contagion

1.1 Apple Inc. and the Disruptive Innovation

Apple Inc. is a company at the epicentre of American business and culture. Furthermore it is one of the most renowned companies in the world. It leads innovation with its products and it is part of life for millions of people around the world.
Apple has represented the start of a new era in which innovation technology is the centre of our lives and where technological devices are essential to improve the quality of life, now even monitoring the health status. Devices such as the ultimate Apple product, the iPhone, and the very latest wearable technology implemented by Apple, the Apple Watch, are studied and intended to follow the user, heading him or her to a best way to live, monitoring for instance the time spent sitting down, standing up, training or measuring heart rate.

The success of Apple has been driven by its singularity, given overall by its CEO, Steve Jobs. He leaded his company adopting an innovative method, using new techniques and changing the way to work in team and to feel part of a company. During a speech after the death of Jobs, in which he was emphasizing Apple's drive for excellence, Timothy Donald (known as "Tim" Cook), the current CEO of Apple, stated that, 'regardless of who is in what job, the values are so embedded in this company that Apple will do extremely well.'
Steve Jobs started his activity from an idea. He conceived and implemented a new and unconventional way to manage a firm, based on simplicity. Simplicity to Steve Jobs is the key concept and it represents also a weapon. He proved that simplicity is the most powerful force in business. It guides the way Apple is organised, how it designs products, and how it connects with customers.
As Jobs said 'simple can be harder than complex. You have to work hard to get your thinking clean to make it simple. But it's worth it in the end, because once you get there, you can move mountains.'

The proactive way to do business that distinguishes Apple from the other companies has incentivised the progress and the development of innovation of products and processes.
It has been disruptive for companies working in the same field or even in different sectors and industries, and it has been significant for people’s everyday life around the world. Steve Jobs has

introduced a new way of living with his company. He marked a break point in the way to do many things, overall changing the way to interact and to be connected with other people.

The importance of its the leader for Apple was undeniable. In fact when Steve Jobs was paradoxically forced out of the company he founded, Apple made a mistake described by Clayton Christensen, a professor at Harvard Business School in his book The Innovator's Dilemma. The example that Christensen explained was the Newton Personal Digital Assistant (PDA). The product had some of the characteristics of a disruptive technology in that it had the potential to take sales away from laptop computers. But rather than start with modest expectations, Apple's CEO at the time, John Sculley, saw it as a key product for the company. He decided to invest millions of dollars to develop this product, dubbed the "Newton." The Newton's saw one of the most totally executed market research efforts in corporate history; extensive market research, focus groups and surveys of every type were used to determine what consumers would want. John Sculley made the Newton's development a personal priority, promoting the product widely, and ensuring that the effort got the technical and financial resources it needed.

Apple sold 140,000 Newtons in 1993 and 1994, its first two years on the market. Most observers viewed the Newton as a big flop. Technically, its handwriting recognition capabilities were disappointing, and its wireless communications technologies had made it expensive.

While Sculley had publicly positioned the Newton as a key product to sustain the company's growth, its first-year sales amounted to about 1 per cent of Apple's revenues. Despite all the efforts, the Newton hardly affected Apple's need for new growth.

The result was a flop on the grandest scale and the device is considered in history as one of Apple's worst failures.

Disruptive technologies often enable something that previously had been considered impossible. Because of this, when they initially emerge, neither manufacturers nor customers know how or why the products will be used, and hence do not know what specific features of the product will and will not ultimately be valued.

Building such markets entails a process of mutual discovery by customers and manufacturers, and this simply takes time. In Apple's development of the desktop computer, for example, the Apple I failed, the first Apple II was quite interesting, and the Apple II succeeded. The Apple III was a market failure because of quality problems, and the Lisa was a failure as well. The first two generations of the Macintosh computer also encountered difficulties. It wasn't until the third iteration of the Macintosh that Apple and its customers finally found the standard for convenient, launching the Newton. Apple assumed that its customers knew what they wanted and spent very aggressively to find out what this was. Then to give customers what they thought they wanted, Apple had to assume the precarious role of a sustaining technology leader in an emerging industry. It spent enormous sums to push mobile data communications and handwriting recognition technologies beyond the state-of-the-art.

When Jobs returned to Apple, he turned the company back into a disrupter. In Job's mind, Apple had become too corporatized during his exile. Its CEOs were professional managers who had little direct involvement in the day-to-day business and were overly focused on profits.
In order to transform Apple into an innovator once again, Jobs cut non-essential products and put the focus back on making great products.
New development projects were protected and overseen by senior managers, often with input from Jobs himself. Ideas were developed, modified, vigorously debated, and sometimes even abandoned at the last minute. At the same time, a new process was created so nothing passed unnoticed or unchecked. Tasks were assigned to a "Directly Responsible Individual". Apple also stopped depending on market research and surveys. Instead, decisions were informed by careful observation of user behaviour. When a brand-new product was released, they nurtured the category over a period of years rather than expecting a blockbuster immediately.

These changes enabled Apple to disrupt industry after industry. For instance the all-in-one iMac was affordable, stylish, and easy to use in a way that computers hadn't been until then. The first iMac was a bold design. It retired the floppy drive and it jump-started USB.
When in 1984 the Mac introduced computer users to the graphical user interface, it shook up the text-based DOS market so dramatically that it forced Microsoft to follow Apple's lead quickly in order to stay relevant. Now graphical user interfaces are the norm on all PCs.
Eighteen months later, Apple pushed the Mac as a disruptor to the publishing market with the introduction of desktop publishing.
Together with the Mac, a desktop laser printer and Aldus' PageMaker software, Apple championed a desktop-publishing solution that completely changed the publishing world by letting people create content on demand and publish it without the help of the publishing industry's solutions. Today, personal publishing on the desktop or on the Web has its roots in Apple's disruptive behaviour.

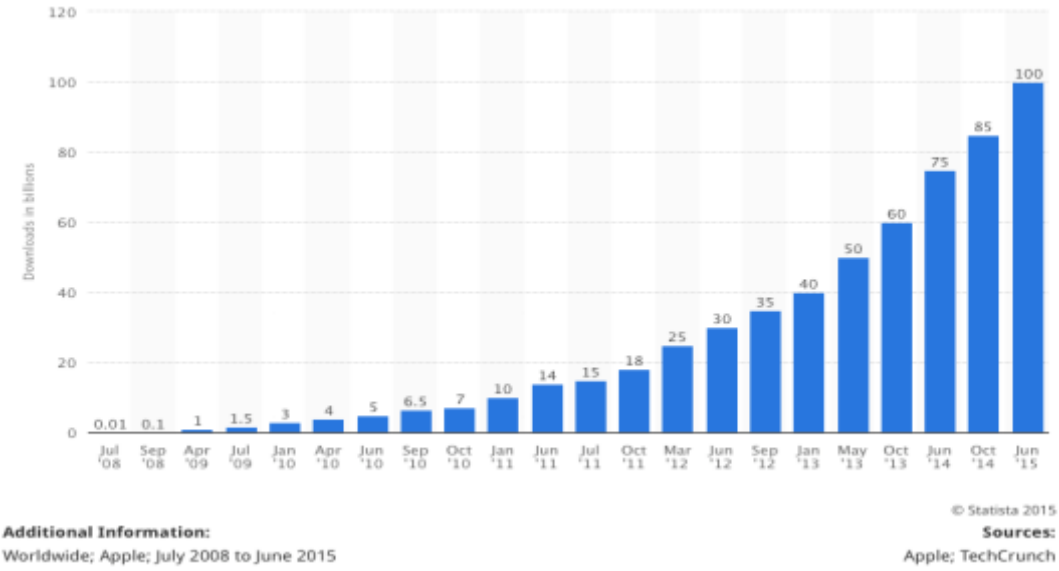
In the early 2000s, Apple changed drastically the digital-music market with the introduction of the iPod and an easy way to access, buy and play music on the go, iTunes.
The iPod paired with iTunes platform transformed the music industry as people began buying songs for ninety-nine cents apiece rather than entire albums. While early MP3 players came out to make digital-music playback more portable, it took Apple with the iPod and iTunes to really disrupt the digital-music market and bring it to the masses.

Then in 2007, Apple disrupted the cell-phone market with the iPhone. While Apple did not invent the smart phone, the company reinvented it in ways that completely changed the wireless carriers' way of controlling their own programs and added the element of a truly intelligent operating system and apps

to the smart-phone landscape. The iPhone has literally redefined what a smart phone is and has dramatically revolutionized the entire telecommunications world. The consequent building of a huge network of applications has introduced also new habits among people. Thanks to them the device is perfectly customized by the final user, who can choose among millions of Apps, depending on his individual needs and preferences, downloading them through the App Store, the digital distribution platform for mobile apps on iOS.

This statistic shows the number of cumulative app downloads from Apple's App Store from July 2008 to June 2015. As of the last reported period, Apple announced that 100 billion apps had been downloaded from its App

Store.[1]



In 2010, Apple introduced the iPad, Job's last brand-new product. It was a device that no one saw a use for before Apple introduced it. The company reinvented the tablet and in the process reinvented the personal computer. Now the iPad has become a major disruptive force in changing the dynamics and fortunes of the traditional PC industry. Thanks to the iPad and tablets overall, traditional PC and laptop sales were off around 10% in 2012. According to some estimates on Time Magazine, tablets will gain more ground in business and consumer markets. The disruptive nature of the iPad was not predicted by anyone except perhaps Steve Jobs, who clearly understood the impact the iPad would have on the market.

[1] At the beginning of 2015, 1.4 million mobile apps were available in the Apple App Store. This figure includes 725,000 native iPad apps. In May 2015, the number of applications submitted for release to the App Store surpassed 40,000 for the first time. The most popular Apple App Store category is gaming with more than 20 per cent of available apps belonging to this category. Other leading app categories based on terms of availability are business apps, education apps, lifestyle apps and entertainment apps.

As it can be seen the iPhone disrupted the iPod business, and the iPad the Mac business and profit margins for the products were higher than or about the same as the categories they cannibalized. This strategy implemented by Apple emerged also by Steve Jobs' words "If you don't cannibalize yourself, someone else will."

Apple's actual cycle of creating innovative and disruptive products is three to four years on average. In the case of the time span from the iPod to the iPhone, it was actually seven years. This suggests that Apple is not driven by time or stock price when it comes to innovation. Rather, the company takes its time to focus on the fusion of the hardware, software and service ecosystem of new and innovative products, before bringing them to market.

There is a key reason for this attention to details. Apple has an internal statement: when it introduces a new category of products that has the potential of shaking up or disrupting a market, it must be done so that Apple will have a two-year lead at the very least over the competition. If not, Apple will not work on it. That is why the company didn't just deliver a new MP3 player, but rather an entire hardware, software and service approach with the iPod. The same goes for the iPhone and the iPad. In both cases, from the time of launch to the time competitors come even close to catching up, Apple had at least a two-year lead.

Apple is a very smart company run by some very futuristic thinkers that have integrated products and services to work with. To think that the company won't use its experience to disrupt other markets is short-sighted. It might take time, but Apple is more than capable of continuing to innovate and drive markets in new directions.

Most likely the next market it will disrupt will be the TV market. Undoubtedly this product will have a dramatic and disruptive nature on the television industry. If done in dramatic fashion, competitors may need more than two years to catch up with Apple.

Another industry Apple could disrupt is the automotive industry. Although cars are getting smarter, they have a lot of room for innovation around embedded screens that are now popping up in cars even in the mid-range price categories. Apple and one or two major carmakers could get together to begin a new era of intelligently connected automobiles that marry dedicated applications, an ecosystem of services and constant Internet connections. The impact could be huge on the future of road travel.

The former Head of Hardware, Tony Fadell, started a path toward the home automation market. He has created the Nest thermostat that is connected to the Internet and is smart enough to watch heating and air-conditioning habits, adjusting them automatically. This suggests that the concept of the smart home was in the works when Fadell was with Apple and that Apple has been working on this internally for some time.

1.2 The evolution of Apple Products

1976 - Apple I - Computer

The Apple I was Apple's first product and it was demonstrated in July 1976 at the Homebrew Computer Club in Palo Alto, California.

The original Apple Computer, also known retroactively as the Apple I, or Apple-1, was released by the Apple Computer Company and was designed and hand-built by Steve Wozniak. Wozniak's friend, Steve Jobs, had the idea of selling the computer. The first unit produced was used in a high school math class, and donated to Liza Loop's public access computer centre. About 200 units were produced and all but 25 were sold during nine or ten months.

The Apple I was a fully assembled circuit board containing about 60+ chips. However, to make a working computer, users still had to add a case, power supply transformers, power switch, ASCII keyboard, and composite video display. The Apple I's built-in computer terminal circuitry was distinctive. All one needed was a keyboard and an inexpensive television set. Competing machines such as the Altair 8800 generally were programmed with front-mounted toggle switches and used indicator lights (red LEDs, most commonly) for output, and had to be extended with separate hardware to allow connection to a computer terminal or a teletypewriter machine. This made the Apple I an innovative machine for its day.

Apple discontinued the Apple I by October 1977. The company offered Apple I owners discounts and trade-ins for Apple IIs to persuade them to return their computers. These recovered boards were then destroyed by Apple, contributing to their rarity today.

So we notice that even if Apple was moving first steps, it has been an innovative company since its start.

1977 - Apple][o //
(Apple I)

Due to its success Apple continued producing products. The next product was the Apple II (styled as Apple][). It is an 8-bit home computer, one of the first highly successful mass-produced microcomputer products, designed primarily by Steve Wozniak in 1977. It is the first model in a series of computers which were produced until Apple IIe production ceased in November 199
Apple with this computer improved its international supply chain: the earliest Apple IIs were assembled in Silicon Valley, and later in Texas; printed circuit boards were manufactured in Ireland and Singapore. The first computers went on sale with a MOS Technology microprocessor, an audiocassettes interface for loading programs and storing data, and the Integer BASIC programming

language built into the ROMs.
To reflect the computer's colour graphics capability, the Apple logo on the casing has rainbow stripes, which remained a part of Apple's corporate logo until early 1998.

Surely in the Apple II we can detect some element and some changes respect to its predecessor Apple I. The concept at the base of Apple computer idea is exactly the same: simplicity. When Apple II debuted in 1977, the Apple II was promoted as an extraordinary computer for ordinary people. The user-friendly design and graphical display made Apple a leader in the first decade of personal computing.

Regarding the design, in the May 1977 BYTE, Steve Wozniak published a detailed description of his design; the article began, "To me, a personal computer should be small, reliable, convenient to use and inexpensive". The design respect to its predecessor is obviously different.

Unlike the earlier Apple I, for which users had to supply essential parts such as a case and power supply, the Apple II was a fully realized consumer product. Design and marketing emphasized it was an everyday tool for home, work, or school.[2]

1980 - Apple III
(Apple II)

The Apple III (often rendered as Apple ///) is a business-oriented personal computer.
The 1980 Apple III did represent many firsts for Apple. The III was the first system designed by Apple as a company. It was designed by two key groups, primarily marketing and engineering. It was the first design to cost Apple 'infinite, incalculable amounts' (as quoted by Steve Jobs: 'Playboy'1985) in research, development and promotional funds. It was also Apple's first market failure.

The Apple III has the same design approximately than the previous Apple II, but it is the first to be built with a monitor. So from that we understand the growing importance of the design and user interface. The idea to build an entire computer, and not only a item to be connected to other devices, is the begin of the creation of an ecosystem of products, thanks to which the customer is brought into a new world.

Unquestionably this is a trial and error phase of Apple history characterized by repeated, varied attempts which are continued until success.

[2] Like many computer and technology ads at the time, Apple's early promotional material was dominated by text. Several decades later, some of the most memorable Apple ads would only have a word or two, such as "Think Different" or "iPod."

1983 - Apple IIe

(Apple II)

The Apple IIe (styled as Apple //e, or sometimes Apple][e) is the third model in the Apple II series of personal computer. The “e” in the name stands for enhanced, referring to the fact that several popular features were now built-in, that were only available as upgrades and add-ons in earlier models. It also improved upon expandability and added a few new features, which, all combined, made it very attractive to first-time computer shoppers as a general-purpose machine.

The Apple IIe has the distinction of being the longest-lived computer in Apple's history, having been manufactured and sold for nearly 11 years with relatively few changes.

Apple Computer planned to discontinue the Apple II series after the introduction of the Apple III; the company intended to clearly establish market segmentation by designing the Apple III to appeal to the business market, leaving the Apple II to home and education users. “Management believed that "once the Apple III was out, the Apple II would stop selling in six months," cofounder Steve Wozniak later said.

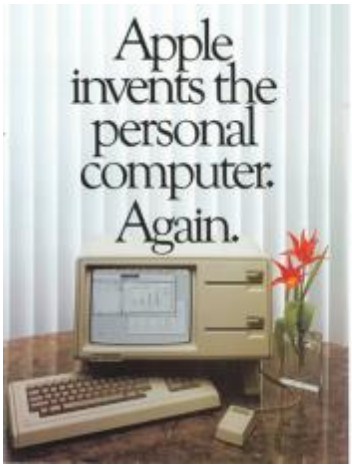
By the time IBM released the rival IBM PC in 1981, the Apple II's technology was already four years old. After the Apple III failed, management decided the further continuation of the Apple II was in the company's best interest.

So after three and a half years at a stand-still, came the introduction of a new Apple II model, the Apple IIe (codenamed "Diana" and "Super II").

Some of the hardware and software features of the Apple III were borrowed in the design of the Apple IIe. The culmination of these changes led to increased sales and greater market share of both home and small business use.

One of the most notable improvements of the Apple IIe is the addition of a full ASCII character set and keyboard.
Regarding the user interface, the most important addition is the ability to input and display lower-case letters. Other keyboard improvements include four-way cursor control and standard editing keys (Delete and Tab), two special Apple modifier keys (Open and Solid Apple), and a safe off-to-side relocation of the "Reset" key.

1983 - Apple Lisa
(Apple III)



While Apple IIe was only an enhancement in the line, the Apple Lisa has been a disruptive product in Apple's products family. In one of the most famous advertisement Apple announces, "We invented the personal computer. Again."
It brings many elements of the previous products but it is very different on different aspects.

The Apple Lisa was an amazing advancement in a user-friendly computer system. Officially, "Lisa" stood for "Local Integrated Software Architecture", but it was also the name of Apple co-founder Steve Jobs' daughter.
The most revolutionary aspect of the Apple Lisa is that it is the first computer with a graphical user interface (GUI) using icons and windows, and the first computer with a mouse.
Prior to the Lisa, all computers were text based (it was necessary to type commands on the keyboard to make the system respond). With the Lisa, it is just needed to point-and-click at tiny pictures on the screen with a small rolling device called a 'mouse'.
Xerox's Palo Alto Research Center (PARC) created the first computer (Xerox Star) with a Graphical User Interface and a mouse, in 1973. But this computer was never sold to the public, and in 1981 the 'Star', which cost $17,000, was far too expensive and sold poorly.

Concerning the elements of contagion from other products we can notice in design some of the characteristics of other products, for instance the colour.

Inside Apple it was created a design language based on colours, the Snow White design Language, used by the Company from the 1984 to 1990.

The Snow White design language was an industrial design language developed by Hartmut Esslinger's Frog Design.

The scheme has vertical and horizontal stripes for decoration, ventilation, and the illusion that the computer enclosure is smaller than it actually is.

The design language boosted Apple's global reputation, set design trends for the computer industry, and molded the perception of computers in the manufacturing and business world. This design helped them establish the firm as a world-class company.

Among other design features, Esslinger's presentation of the Apple logo, a three-dimensional logo inlaid into the product case with the product name printed onto its surface, was included on nearly every product for several years.

1984 - Macintosh 128k

(Apple IIe - Apple Lisa)

The Macintosh 128K, originally released as the Apple Macintosh, is the original Apple Macintosh personal computer. Its beige case contained a 9 in (23 cm) monitor and came with a keyboard and mouse.

A very innovative addition for that time was an handle built into the top of the case which made it easier for the computer to be lifted and carried.

It had an initial selling price of $2,495 (equivalent to $5,664 in 2015). Sales of the Macintosh were strong from its initial release on January 24, 1984, and reached 70,000 units on May 3, 1984.

The Macintosh was designed to achieve adequate graphics performance, which had previously required hardware costing over US$100,000, a price inaccessible to the middle class. This narrow goal resulted in an efficient design which traded off expandability but met or exceeded the baseline performance of its competitors.

The computer was released in January 1984 as simply the Apple Macintosh. Following the release of the Macintosh 512K in September, which expanded the memory from 128 KB to 512 KB, the original Macintosh was re-branded Macintosh 128K and nicknamed the 'thin Mac'.

Steve Jobs decided to launch the Apple Macintosh in an original way, through the famous “1984” television commercial.
It introduced the Macintosh using these words «On January 24th Apple Computer will introduce Macintosh. And you'll see why 1984 won't be like "1984"»[3]
The "1984 Macintosh" is less similar in design to Apple Lisa. It is lighter and slimmer and it is conceived to be more portable than the predecessors. While the base concept of simplicity is always remarked, overall in the interface. We can see from the image an "Hello" on the screen. Surely it lets the customer be more familiar with the the computer, becoming more and more personal.

1984 - Apple IIc
(Apple IIe - Macintosh 128k)

The Apple IIc, the fourth model in the Apple II series of personal computers, is Apple Computer’s first endeavour to produce a portable computer.
The result was a 7.5 lb (3.4 kg) notebook-sized version of the Apple II that could be transported from place to place.

It was conceived by Steve Hayden, Brent Thomas and Lee Clow at Chiat Day, produced by New York production company Fairbanks Films, and directed by Ridley Scott. English athlete Anya Major performed as the unnamed heroine and David Graham as Big Brother. "1984" used the unnamed heroine to represent the coming of the Macintosh (indicated by her white tank top with a stylized line drawing of Apple’s Macintosh computer on it) as a means of saving humanity from "conformity" (Big Brother). These images were an allusion to George Orwell's noted novel, Nineteen Eighty-Four, which described a dystopian future ruled by a televised "Big Brother".
Originally a subject of contention within Apple, it has subsequently been called a watershed event.
In 1995, The Clio Awards added it to its Hall of Fame, and Advertising Age placed it on the top of its list of 50 greatest commercials.

The c in the name stood for compact, referring to the fact it was essentially a complete Apple II computer setup (minus display and power supply) squeezed into a small notebook-sized housing.

That was the intended direction for this model: a more appliance-like machine, ready to use out of the box, requiring no technical know-how or experience to hook up and therefore attractive to first-time users.

The Apple IIc was released on April 24, 1984, during an Apple-held event called Apple II Forever. With that motto, Apple proclaimed the new machine was proof of the company's long-term commitment to the Apple II series and its users, despite the recent introduction of the Macintosh.

While essentially an Apple IIe computer in a smaller case, it was not a successor, but rather a portable version to complement it. One Apple II machine would be sold for users who required the expandability of slots, and another for those wanting the simplicity of a plug and play machine with portability in mind.

While relatively light-weight and compact in design, the Apple IIc was not a true portable in design as it lacked a built-in battery and display.

The machine was conceived with Snow White design language, notable for its case styling and a modern look which became the standard for Apple equipment and computers for nearly a decade.
The Apple IIc introduced a unique off-white coloring known as “Fog,” chosen to enhance the Snow White design style. The IIc and some peripherals were the only Apple products to use the "Fog" coloring.

1985 - Apple IIe Enhanced
(Apple IIe)

In March 1985 Apple introduced the Enhanced //e. It was identical in every aspect to the original][e, the only difference being four socketed chips had been changed on the motherboard.

The purpose of the update was to make the Apple IIe more compatible with the Apple IIc (released the previous year) and to a smaller degree, the Apple II Plus. This change involved a new processor.

1985 - Platinum IIe
(Apple IIe)

In January 1987 came the final revision of the Apple IIe, often referred to as the Platinum IIe, due to the color change of its case to the light-grey color scheme that Apple dubbed "Platinum".
Changes to this revision were mostly cosmetic to modernize the look of the machine.
Besides the color change, there was a new keyboard layout with built-in numeric keypad.

1986 - Macintosh Plus
(Macintosh 128k e 512k)

The Macintosh Plus computer is the third model in the Macintosh line, introduced on January 16, 1986, two years after the original Macintosh and a little more than a year after the Macintosh 512K, as an evolutionary improvement.

The Macintosh Plus was the last classic Mac to have a phone cord-like port on the front of the unit for the keyboard, as well as the DE-9 connector for the mouse.
It offered double the capacity of floppy disks for previous Macs.

The applications MacPaint and MacWrite were bundled with the Mac Plus. Third-party software applications available included MacDraw, Microsoft Word, Excel, and PowerPoint, as well as Aldus's PageMaker.
Microsoft Excel and PowerPoint (originally by Forethought) were actually developed and released first for the Macintosh.

The case design is essentially identical to the original Macintosh.
It debuted in beige and was labelled Macintosh Plus on the front, but Macintosh Plus 1MB on the back, to denote the 1 MB RAM configuration with which it shipped.

In January 1987 it transitioned to Apple's long-lived platinum-gray color with the rest of the Apple product line, and the keyboard's keycaps changed from brown to grey. In January 1988, with reduced RAM prices, Apple began shipping 2- and 4- MB configurations and rebranded it simply as "Macintosh Plus".
Among other design changes, it included the same trademarked inlaid Apple logo.

1986 - Apple IIgs
(Macintosh Plus - Apple IIe - Platinum IIe)

The Apple IIGS (stylized as IIgs) is the fifth and most powerful model in the Apple II series of personal computers produced by Apple Computer.
It has some elements of the Apple IIe and Platinum IIe. The "GS" in the name stands for Graphics and Sound, referring to its enhanced multimedia capabilities, especially its state-of-the-art sound and music synthesis, which greatly surpassed previous models of the line and most contemporary machines like the Macintosh and IBM PC.

The Apple IIGS was the first computer produced by Apple to use a color graphical user interface, as well as the "Platinum" (light grey) color scheme and the Apple Desktop Bus interface for keyboards, mice, and other input devices.

1987 - Macintosh SE
(Macintosh 128k - Macintosh Plus - Apple IIgs)

Introduced at the same time as the Macintosh II, the Mac SE further addressed the issue of expansion. As we can see from the picture it came in a new platinum case, had an expansion slot, and included a bay for either a second internal floppy drive, or

an internal hard drive.
The Mac SE was also one of the first Macs to include an Apple Desktop Bus (ADB), which is a bit-serial computer bus connecting low-speed devices to computers.

1987 - Macintosh II
(Apple IIe - Macintosh SE)

The Apple Macintosh II is the first personal computer model of the Macintosh II series in the Apple Macintosh line.

Macintosh II has some improved design characteristics of Apple IIe and technical from Macintosh SE. Nevertheless it has a substantial difference: it is the first Macintosh to support a colour display, a feature that will appear in all the following products.

A basic system with 20 MB drive and monitor cost about $5200, A complete colour-capable system could cost as much as $10,000 once the cost of the colour monitor, video card, hard disk, keyboard and RAM were added. This price placed it in competition with workstations from Silicon Graphics, Sun Microsystems and Hewlett-Packard.

Two common criticisms of the Macintosh from its introduction in 1984 were the closed architecture and lack of colour.

1989 - Macintosh IIci
(Macintosh II)

The IIci was one of the most popular and longest-lived Mac models of all time. For much of its lifespan, it was the business "workhorse" of the Macintosh line.
In fact we will find most of the traits of this product in all other products, for instance the unique design characterized by the Snow White Design Language.[4]

[4] An Easter egg exists in the IIci ROM. If the system date is set to September 20, 1989 (the machine's release date) and the Command - Option - C - I buttons held during boot time, an image of the development team will be displayed.

1989 - Macintosh Portable

(Macintosh IIci)

An incredibly innovative product for its time, the Macintosh Portable is Apple Inc.'s first battery-powered portable Macintosh personal computer. It was received with excitement from most critics but consumer sales were quite low.

It featured a fast, sharp, and expensive black and white active matrix LCD screen in a hinged design that covered the keyboard when the machine was not in use.
The Portable was one of the early consumer laptops to employ an active matrix panel, and only the most expensive of the initial Powerbook line, the Powerbook 170, used one, due to the high cost.

Apple portable personal computer is a disruptive product, the first of a series of portable devices.

The cursor pointing function was handled by a built-in trackball that could be removed and located on either side of the keyboard. It used expensive SRAM in an effort to maximize battery life and to provide an "instant on" low power sleep mode. The machine was designed to be high-performance, at the cost of price and weight.

It was clunky, slow, had no expansion capabilities, and its active matrix screen (later backlit) made it incredibly expensive.

Furthermore the signatures of the product design team can be seen in the molded plastic of the case if one removes the motherboard.

1990 - Macintosh lc (family)

(Apple IIgs)

The original Macintosh LC was released in October 1990 and was the first affordable color-capable Macintosh. The Macintosh LC (meaning low-cost color) is Apple Computer's product family of low-end consumer Macintosh personal computers in the early 1990s.

Due to its affordability and Apple II compatibility the LC was adopted primarily in the education and home markets.[5]

After Apple co-founder Steve Jobs left Apple in 1985, product development was handed to Jean-Louis Gassée, formerly manager of Apple France. Gassée consistently pushed the Apple product line in two directions, towards more "openness" in terms of expandability and interoperability, and towards higher price.

Gassée long argued that Apple should not market their computers towards the low end of the market, where profits were thin, but instead concentrate on the high end and higher profit margins.

1990 - Macintosh Classic

(Macintosh 128K - Macintosh SE - Macintosh lc)

The Macintosh Classic was the final adaptation of Jerry Manock's and Terry Oyama's Macintosh 128K industrial design, bringing back some elements of the original, while retaining little of the Snow White design language used in the Macintosh SE's design.

The curve of the front bezel was increased to the same 50-

[5] In the figure on the right, the LC family (LC, II, III, 475, Quadra 605) front face.

inch (1.3 m) radial curve as on the front of both the Macintosh LC and Macintosh IIsi. The screen brightness dial on this bezel was also removed in favor of a software control.

This broad, curved front bezel became a signature of Apple product design for much of the 1990s, until the 2000s when this characteristic was abandoned in favour of the Cinema Display.

Reviewer reactions were mixed; most focused on the slow processor performance and lack of expansion slots. The consensus was that the Classic was only useful for word processing, spreadsheets and databases.
It was sold alongside the more powerful Macintosh Classic II in 1991 until its discontinuation the next year.

1991 - Quadra 700, 900 (family)

Quadra 700 was the first in a new family of Macs, and was the first Mac to ship in a tower case.
The design adopted for this tower case will be left from the production of the PowerMac G3.

The Macintosh Quadra 900 is a high-end personal computer introduced with the Quadra 700 in October 1991 as Apple Computer's first computers in the Quadra series using the Motorola 68040 processor.
It was discontinued in 1992, and succeeded by the very similar Quadra 950.

1991 - Powerbook 100 series
(Macintosh Portable)

The PowerBook (known as Macintosh PowerBook before 1997) is a line of Macintosh laptop computers that was designed, manufactured and sold from 1991 to 2006.
It brings some of the portable characteristic of the Portable for example the built-in trackball.
During its lifetime, the PowerBook went through several major revisions and redesigns, often being the first to incorporate features that would later become standard in competing laptops.

1992 - Powerbook Duo
(Powerbook 100 series)

In 1992 Apple released a hybrid portable/desktop computer, the PowerBook Duo.
The Duos were a series of very thin and lightweight laptops with a minimum of features. It could be inserted into a docking station to provide the system with extra video memory, storage space, connectors, and could be connected to a monitor.

1993 - Color Classic
(Macintosh Classic)

In 1993 Apple starts to focus on coloured screens with models like the Color Classic and the Macintosh Centris. Screen becomes more familiar and the user interface allows to interact in a more useful way, thanks to more functions.
The Macintosh Color Classic, released on February 10, 1993, is the first color compact Apple Macintosh computer. It had an integrated 10″ Sony Trinitron color display with the same 512×384 pixel resolution as the Macintosh 12″ RGB monitor. This integrated unit resembled the original Mac series, albeit redesigned to accommodate the larger screen and conform to Apple's "neoclassical" design language of the era.

1993 - Macintosh Centris
(Color Classic)

Macintosh Centris is a line of Macintosh computers, introduced in 1993, that were built around the Motorola 68LC040 and 68040 CPUs.
The name was chosen to indicate that the consumer was selecting a Macintosh in the center of Apple's product line.

1993 - Macintosh TV

(Macintosh LC 500 series)

The Macintosh TV was Apple Computer's first attempt at computer-television integration. It shared the external appearance of the Macintosh LC 500 series, but in black.

It was the first Macintosh to be made in black and came with a custom black keyboard and mouse.

1993 - Newton MessagePad

The MessagePad is the first series of personal digital assistant devices developed by Apple Computer for the Newton platform in 1993.

It has been discussed about it in the introduction of this chapter. Even if the CEO at the time, John Sculley, saw it as a key product for the company, this kind of device was too innovative for its times. The public was not ready to accept it and use it as a substitute of the laptop.

With this product a trial-and-error phase starts. Later in 1997, Apple will try to disrupte the market again with another innovative device, the eMate. But only in 2010, sales of the iPad, will confirm that it was only too early.

Newton devices featuring Newton OS 2.1 or higher can be used with the screen turned horizontally ("landscape") as well as vertically ("portrait").

A change of a setting rotates the contents of the display by 90, 180 or 270 degrees.

Handwriting recognition still works properly with the display rotated, although display calibration is needed when rotation in any direction is used for the first time or when the Newton device is reset.

1994 - Newton MessagePad 110

(Newton MessagePad)

Later releases of the Newton operating system retained the original recognizer for compatibility, but added a hand-printed-text-only (not cursive) recognizer, called "Rosetta", which was developed by Apple.

1994 - Powerbook 150 - 500 series
(Powerbook Duo)

With the Powerbook series Apple keeps on focusing on the production of more and more portable devices.
These models of PowerBooks were much sleeker and faster than the 100 series, which they replaced as the mid and high-end models.
The PowerBook 150 is a laptop personal computer which was introduced on July 13, 1994 and released on July 18, 1994. It was the last member of the PowerBook 100 series to use the original case design, the most affordable of the series when introduced, priced between $1450 and $1600, and also the last consumer model.

It was 8 MHz faster than its predecessor. It lacked an ADB port and used a lower quality passive matrix display than other current offerings, both to reduce the price. It also lacked external monitor support. Like the Duos & PowerBook 100 before it, the 150 only had a single serial printer port, however, a third party adapter was available for use in the optional modem slot.
The PowerBook 500 series (codenamed Blackbird) is a range of Apple Macintosh PowerBook portable computers first introduced by Apple Computer with the 540c model on May 16, 1994. It was the first to have stereo speakers and Ethernet networking built-in.

It was the first PowerBook series to use a Motorola 68LC040 CPU (simultaneous with Duo 280) and be upgradeable to the PowerPC architecture via a swap out CPU daughter card, PC Card capability, two battery bays (and a ten-minute sleep/clock battery, which allowed for main batteries to be swapped out while in sleep mode), full size keyboard with F1-F12 function keys, be able to sleep while connected to an external monitor and have a battery contact cover included on the actual batteries. It included a single serial port which could be to connect to a serial printer or a network via Apple's LocalTalk. In another first, it also included an AAUI port for connecting to non-LocalTalk (usually Ethernet) networks.

The 540c was rated #2 of the all-time best PowerBook models made according to Insanely Great Macintosh (survey taken Nov 2000).

1995 - Macintosh LC

(Macintosh TV - LC family - Macintosh Centris - Color Classic)

The Macintosh LC 500 series is a series of personal computers that were a part of Apple Computer's LC line of Macintosh computers. It was Apple's mid-1990s upper low end-range series, positioned below the Centris and Quadra but above the Classic II and Color Classic models.

All of these computers were also sold under the Macintosh Performa brand, in some cases under slightly different model numbers.

These computers all shared the same all-in-one desktop case that included a 14" CRT display, CD-ROM drive, and stereo speakers. Designed as a successor to the compact all-in-one Macintosh, the case was reminiscent of Apple's earlier Compact Macintosh series but considerably larger and bulkier, with a larger screen (compared to the Compact's 9- or 10-inch displays) and a bulging midsection to contain the larger electronics, in stark contrast to the compact Macs' slimmer designs.

The 500 series included four main models, the 520, 550, 575, and 580, with the 520 and 550 both using different speeds of the Motorola 68030, and the 575 and 580 sharing the 33MHz Motorola 68LC040 processor but differing on the rest of the hardware.

The LC models in particular became very popular in schools for their small footprint, lack of cable-clutter, and durability.

The Macintosh TV is closely related to this series, using the same case (in black instead of platinum) and a logic board similar to the Macintosh LC 550. The compact Color Classic series shares many components, and is able to swap logic boards, with the early 500 series machines.

1997 - eMate

(Newton Message Pad - 110 - Powerbook 500 series)

EMate is an example of disruptive innovation. It was born when Steve Jobs came back to Apple.

The eMate 300 is a personal digital assistant designed, manufactured and sold by Apple Computer to the education market as a low-cost laptop running the Newton operating system.

The eMate 300 featured a green-colored translucent durable case designed for intense use in classrooms; a dark green-colored keyboard similar to that of PowerBooks of the same era (Powerbook G3).

Purple, clear, red, and orange colored eMate prototypes were produced for show only and were never put into mass production.

1997 - TAM (Twentieth Anniversary Macintosh)

The Macintosh celebrating the 20th Anniversary was designed by one of the most influential people in Apple team and in the world, Jonathan Ive.
Apple's Twentieth Anniversary Macintosh was a limited-edition personal computer released in 1997. This machine was a showcase of Apple's technology of the day, with a price tag that aimed it at the "executive" market.

The normal timespan to develop a new Macintosh computer was 18+ months, however they were already late. Luckily the design team had already been working on several "dream" concepts, and soon settled on the almost All-in-One LCD based design.

The TAM was to break the established form factor of the personal computer. One of the first projects of Jonathan "Jony" Ive, the design of the TAM was both a state-of-the-art futuristic vision of where computing could go as well as a redevelopment of Apple's original objective to create a device that would integrate into people's lives.

The TAM came with a unique 75 key ADB keyboard, which featured leather palm-rests and a trackpad instead of a mouse. The trackpad could be detached from the keyboard if desired, with a small leather insert found underneath the keyboard ready to fill the gap. When not required, the keyboard could slide under the TAM's head unit, leaving the trackpad exposed for continued access.

The TAM also came with a remote control (standard with the Apple TV/FM Tuner card), but also featured buttons on the front panel that could control sound levels, CD playback, brightness, contrast, and TV mode

A fairly thick "umbilical" cable connects the base unit to the head unit, supplying both power, and communications for the subwoofer. The umbilical connects to the base unit via a multi-pin connector, which is the possible cause of the TAM's one major fault - the "speaker buzz". Inspections of units that received a repair by Apple due to the speaker buzz found an extra resistor/s had been installed in the umbilical. Ensuring the connectors are free of dust/dirt has also been known to resolve the "buzz".

1997 - Powerbook G3
(Powerbook series 150 - 500)

It was introduced in November 1997. At the time of its introduction, the PowerBook G3 was advertised as the fastest notebook computer available.

The PowerBook G3/400 Firewire/Pismo (formally a member of the "PowerBook Firewire" series), as dubbed by Apple, but often referred to by its codename of "Pismo", features a 400 MHz PowerPC 750 (G3) processor with 1 MB of "backside" level 2 cache, 64 MB of RAM, a 6.0 GB or 10.0 GB hard drive, a tray-loading 6X DVD-ROM drive, and ATI Rage Mobility 128 graphics with 8 MB of SDRAM in a sleek black portable case with a 14.1" TFT active-matrix color display.

1998 - iMac

(Twentieth Anniversary Macintosh)

With the iMac there is a colour explosion inside the company. It is a break point across the Apple history. The colour characteristic will be abandoned after the iMac Patterns, in 2001 and it will be come back with the PowerMac G3.

The announcement of the iMac in 1998 was a source of controversy and anticipation among commentators, Mac fans, and detractors. Opinions were divided over Apple's drastic changes to the Macintosh hardware.

Jonathan Ive was the designer behind the iMac's case. [6]

Attention was given to the out-of-box experience: the user needed to go through only two steps to set up and connect to the Internet. [7]

[6] Ken Segall was an employee at an L.A. ad agency handling Apple's account who came up with the name "iMac" and pitched it to Steve Jobs. Jobs wanted the product to be called "MacMan", but eventually warmed to Segall's suggestion. Segall says that the "i" stands for "Internet", but also represents the product as a personal and revolutionary device ('i' for "individuality" and "innovation").

[7] "There's no step 3!" was the catch-phrase in a popular iMac commercial narrated by actor Jeff Goldblum. Another commercial, dubbed "Simplicity Shootout", pitted seven-year-old Johann Thomas and his border collie Brodie, with an iMac, against Adam Taggart, a Stanford University MBA student, with an HP Pavilion 8250, in a race to set up their computers. Johann and Brodie finished in 8 minutes and 15 seconds, whereas Adam was still working on it by the end of the commercial.

Apple later adopted the 'i' prefix across its consumer hardware and software lines, such as the iPod, iBook, iPhone, iPad and various pieces of software such as the iLife suite and iWork and the company's media player/store, iTunes.

The original iMac was the first legacy-free PC. It was the first Macintosh computer to have a USB port but no floppy disk drive. Subsequently, all Macs have included USB. Via the USB port, hardware makers could make products compatible with both x86 PCs and Macs. Previously, Macintosh users had to seek out certain hardware, such as keyboards and mice specifically tailored for the "old world" Mac's unique ADB interface and printers and modems with MiniDIN-8 serial ports. Only a limited number of models from certain manufacturers were made with these interfaces, and often came at a premium price. USB, being cross-platform, has allowed Macintosh users to select from a large selection of devices marketed for the Wintel PC platform, such as hubs, scanners, storage devices, USB flash drives, and mice. After the iMac, Apple continued to remove older peripheral interfaces and floppy drives from the rest of its product line.

Borrowing from the 1997 Twentieth Anniversary Macintosh, the various LCD-based iMac designs continued the all-in-one concept first envisioned in Apple's original Macintosh computer. The successful iMac allowed Apple to continue targeting the Power Macintosh line at the high-end of the market. This foreshadowed a similar strategy in the notebook market when the iMac-like iBook was released in 1999. Since then, the company has continued this strategy of differentiating the consumer versus professional product lines. Apple's focus on design has allowed each of its subsequent products to create a distinctive identity.

Apple avoided using the beige colors then pervading the PC industry. The company would later drift from the multicolored designs of the late 1990s and early-2001s. The latter 2001s saw Apple using anodized aluminium; glass; and white, black, and clear polycarbonate plastics among their build materials. Today many PCs are more design-conscious than before the iMac's introduction, with multi-

shaded design schemes being common, and some desktops and laptops available in colorful, decorative patterns.

Apple's use of translucent, candy-colored plastics inspired similar designs in other consumer devices (e.g., kitchen countertop grilling machines; portable electronics; pencil sharpeners; and, video game consoles and peripherals (including the Nintendo 64, which was released in special edition 'Funtastic' colors). Apple's later introduction of the iPod, iBook G3 (Dual USB), and iMac G4 (all featuring snowy-white plastic), inspired similar designs in other company's consumer electronics products. The color rollout also featured two distinctive ads: one called 'Life Savers' featured the Rolling Stones song "She's a Rainbow" and an advertisement for the white version had the introduction of Cream's "White Room" as its backing track.

Steve Jobs reduced the company's large product lines immediately upon becoming Apple's interim CEO in 1997. Toward the end of the year, Apple trimmed its line of desktop Macs down to the beige Power Macintosh G3 series, which included the iMac's immediate predecessor, the Power Macintosh G3 All In One, which featured nearly identical specifications and was sold only to the educational market. Having discontinued the consumer-targeted Performa series, Apple needed a replacement for the Performa's price point. The company announced the iMac on May 6, 1998 and began shipping the iMac G3 on August 15, 1998.

The iMac was dramatically different from any previous mainstream computer. It was made of translucent "Bondi Blue"-colored plastic, and was egg-shaped around a 14-inch (35.5 cm) CRT display. The case included a handle, and the peripheral connectors were hidden behind a door on the right-hand side of the machine. Dual headphone jacks in the front complemented the built-in stereo speakers. Sir Jonathan Ive, currently Senior Vice President of Industrial Design at Apple, is credited with the industrial design. Its unique shape and color options helped ingrain itself into late 1990s pop culture. The iMac was the first computer to exclusively offer USB ports as standard, including as the connector for its new keyboard and mouse, thus abandoning previous Macintosh peripheral connections, such as the ADB, SCSI and GeoPort serial ports.

A further radical step was to abandon the 3½-inch floppy disk drive which had been present in every Macintosh since the first in 1984. Apple argued that recordable CDs, the Internet, and office networks were quickly making diskettes obsolete, however, Apple's omission generated controversy. At the time of iMac's introduction, third-party manufacturers offered external USB floppy disk drives, often in translucent plastic to match the iMac's enclosure.

The keyboard and mouse were redesigned for the iMac with translucent plastics and a Bondi Blue trim. The Apple USB Keyboard was smaller than Apple's previous keyboards, with white characters on black keys, both features that attracted debate. The Apple USB Mouse was mechanical, of a round, "hockey puck" design, which was derided as being unnecessarily difficult for users with larger hands.

Apple continued shipping the round mouse, adding a divot to the button in later versions so that users could distinguish proper orientation by feel. Eventually, a new capsule-shaped optical mouse, known as the Apple Mouse (formerly "Apple Pro Mouse"), replaced the round mouse across all of Apple's hardware offerings.

1998 - Studio Display

Studio Display is the first display produced by Apple using a LCD screen. It was introduced with the non-colour matched Power Macintosh G3/300 and Power Macintosh G3/300 MT. It features a 15.1" viewable area active-matrix LCD display perched upon a dark blue adjustable stand with integrated ADB and S-Video in ports. Some inputs Apple Studio Displays used were USB, Composite video, S-Video, ADB, RCA audio connectors, and headphone jacks.

Although sales were modest, this display inititated the transition from CRT-based to LCD-based displays.

1999 - PowerMac G3
(Quadra family)

The last tower cases produced before the PowerMac G3 were Quadra family's tower cases. Its design is very different compared to the predecessor.

The Power Macintosh G3 series (commonly known as the "Blue and White G3", or sometimes either as the "B&W G3" or "Smurf Tower" to distinguish it from the original Power Macintosh G3) is a short-lived series of personal computers. It was introduced in January 1999, succeeding the original "beige" Power Macintosh G3, with which it shared the name and processor architecture but little else. It was discontinued in favor of the Power Mac G4 line in August 1999.

The outside of the Power Mac G3 showes the ring-shaped latch that opened the case.
The blue and white G3's case design was widely praised at the time for being easy to open up and work on. The entire right side of the case was a door that hinged down by pulling a recessed latch at the top. The logic board was positioned in the door, providing easy access to all components.

1999 - Studio CRT Display

(Studio Display - PowerMac G3)

The 17" Apple Studio Display CRT (Cathode Ray Tube) is remarkable for being the last CRT-based display that Apple ever shipped.

It was released in conjunction with the Power Macintosh G4/400, Power Macintosh G4/450 DP, and Power Macintosh G4/500 DP systems. It features a 17.0" (16.0" viewable area) Natural Flat Diamondtron CRT, ColorSync internal color calibration, and a "Theater Mode" which provides "increased screen brightness for enhanced viewing of full screen iMovie, DVD or QuickTime content", all housed in a "crystal clear" enclosure. This model uses the ADC (Apple Display Connector), which carries analog and digital video signals, USB data, and power in the same cable.

1999 - PowerMac G4

(PowerMac G3 - Studio Display - Studio CRT Display)

The Power Mac G4 (originally Power Macintosh G4) is a series of personal computers that was designed, manufactured, and sold by Apple between 1999 and 2004.

A new line with a revamped motherboard but the familiar "Graphite" case debuted on January 9, 2001. It was essentially a future Quicksilver inside an older case.

1999 - iBook G3 (Clamshell)

(iMac - eMate - PowerMac G4)

The iBook is a line of laptop computers sold by Apple Computer from 1999 to 2006. The line targeted entry level, consumer and education markets, with lower specifications and prices than the PowerBook, Apple's higher-end line of laptop computers.[8]

The G3, known as the "Clamshell", was influenced by the design of Apple's popular iMac line at the time. It was a significant departure from previous portable computer designs due to its shape, bright colors, incorporation of a handle into the casing, lack of a hinged cover over the external ports, and built-in wireless networking.
Unlike the iMac, the iBook did not use pinstripes. While, like the iMac, the iBook G3 had a PowerPC G3 CPU, and no legacy Apple interfaces, USB, Ethernet, modem ports and an optical drive were standard. The ports were left uncovered along the left side: a cover was thought to be fragile and unnecessary with the iBook's new interfaces, which lacked the exposed pins of earlier connectors. When the lid was closed, the hinge kept it firmly shut, so there was no need for a latch on the screen. Furthermore the hinge included an integrated carrying handle.

Below the five colors of the iBook Clamshell Series. Top row: "Tangerine" and "Blueberry"; bottom row: "Graphite", "Indigo" and "Key Lime". The Graphite color was available in both iBook generations, which can be differentiated by their white plastics (pinstriped versus translucent).[9]

Additional power connectors on the bottom surface allowed multiple iBook G3s to be charged on a custom-made rack. The iBook G3 was the first Mac to use Apple's new "Unified Logic Board Architecture", which condensed all of the machine's core features into two chips, and added AGP and Ultra DMA support.

[8] They were a major name for education, with Henrico County Public Schools being the first of many school systems in the USA to distribute one to every student.

[9] Source: https://commons.wikimedia.org/wiki/File:IBook_flavors.jpg

There was heated debate over many things such as the aesthetics, features, weight, performance, and pricing. To provide good impact protection, the iBook was larger and heftier than the PowerBook of the time, and yet had lower specifications. Standard features like PC card slots were absent. Speculated features such as touch-screens and an ultra-long battery life were absent.
Two years later, the second generation abandoned the original form factor in favor of a more conventional, rectangular design, with the 2000 Powerbook G3 series.[10]

In October 2003, a third iteration was released that added a PowerPC G4 chip and a slot-loading drive. Apple replaced the iBook line with the MacBook in May 2006 during Apple's transition to Intel processors. The MacBook has also evolved into different models, such as the MacBook Pro targeting high performance and the MacBook Air targeting the entry level, consumer ultrabook-market.

A simplified "four box" strategy

In the late 1990s, Apple was trimming its product line from the bewildering variety of intersecting Performa, Quadra, LC, Power Macintosh and PowerBook models to a simplified "four box" strategy: desktop and portable computers, each in both consumer and professional models. Three boxes of this strategy were already in place: The newly introduced iMac was the consumer desktop, the Blue and

[10] The iBook gained the label "Barbie's toilet seat", due to the distinctive design. Nevertheless, this same design made the iBook G3 unmistakable in movies and television shows.

White G3 filled the professional desktop box, and the PowerBook line served as the professional portable line. This left only the consumer portable space empty, leading to much rumor on the Internet of potential designs and features. Putting an end to this speculation, Steve Jobs unveiled the iBook G3 during the keynote presentation of Macworld Conference & Expo, New York City on June 21, 1999.

The design was clearly influenced by Apple's consumer desktop, the iMac. In fact, one of the marketing slogans for the iBook was "iMac to go". The clamshell design also echoed the eMate 300. Apple continued its trend of using transparent colored plastics for the shell, and released the iBook clamshell series in several colors, starting with Blueberry and Tangerine. Later in the series, Apple added Indigo, Graphite, and Key Lime.

The iBook was a commercial success. The line continually received processor, memory, hard disk upgrades, and new colours. FireWire and video out were later added. The design was discontinued in May 2001, in favor of the new "Dual USB" iBooks.

Compared to follow-up iBook and PowerBook notebook computers, the Clamshell iBook proved to be the more reliable model.[11]
Vestiges of design ideas first adopted in the iBook G3 can still be seen today: moving interface ports from the back to the sides and leaving them uncovered, omitting a latch for the computer's lid and providing color options and an eye-catching design intended to be seen with the computer open.

1999 - iMac DV

(iMac)

Apple Computers introduced a family of all-new iMac Computers Oct. 5, 1999.
The New Family Includes Imac, Imac Dv (Pictured) for 'Digital Video' And Imac Dv Special Edition, which comes in a new clear graphite-colored enclosure.[12]

[11] The original iBook is on exhibition at the London Design Museum and the Yale University Art Gallery.

[12] All iMac DV and iMac DV Special Edition models shipped in the U.S. include a DVD of Disney/Pixars *A Bugs Life*, so customers can watch their first DVD movie on iMac right out of the box.

2000 - Powerbook G3

(Powerbook G3 Pismo)

The PowerBook G3 is a line of laptop Macintosh computers produced by Apple Computer between 1997 and 2001.

PowerBook G3 Kanga

The first Macintosh PowerBook G3, code-named "Kanga," was introduced in November 1997. At the time of its introduction, the PowerBook G3 was advertised as the fastest notebook computer available.

The Kanga was on the market for less than 5 months, and is largely regarded as a stopgap system that allowed Apple to ship G3 PowerBooks sooner, while Apple prepared its more revolutionary PowerBook G3 Series. As a result, the Kanga has the dubious distinction of being Apple's fastest depreciating PowerBook. Nevertheless, many people chose to purchase a Kanga to continue using their interchangeable expansion bay modules, batteries, and other peripherals from the Powerbook 190, 5300 and 3400 models. The Kanga was also notably smaller in depth and width than the subsequent Wallstreet Powerbooks, and the Kanga remained the smallest-when-open G3 laptop until the debut of the Apple iBook some years later.

PowerBook G3 Series (Wallstreet Series I)

The second generation of PowerBook G3s, now called the PowerBook G3 Series, was introduced in March 1998. The machine was completely redesigned with a new case that was lighter and more rounded than the previous PowerBook G3.

It also came in three CPU speeds: 233 MHz, 250 MHz, and 292 MHz. The 233 MHz model was sometimes nicknamed Mainstreet, as it lacked L2 cache, making it far slower than the other two in the lineup.

The 250 MHz and 292 MHz models shipped with 1 MB of cache. Because of this large cache, as well as the swifter system bus, the Wallstreets were known to suffer from some heat issues. Many of the problems of the Wallstreet PowerBook G3s were fixed in the next revision, the Wallstreet II.

PowerBook G3 Series (Wallstreet Series II, AKA PDQ)

The Wallstreet design was updated on August 1998 (Wallstreet-II). It featured a 14.1" display on all models. The PowerBook G3 Series was Apple's first notebook offering that matched the build-to-order customization of the Power Mac G3 desktop line.

Discontinued in May 1999, this would be the last Apple computer ever to bear the rainbow-colored Apple logo and the last Mac to support Apple's Superdrive. It was also the last Old World ROM model in the PowerBook series.

PowerBook G3 Series (Bronze Keyboard)

The third generation of PowerBook G3 (Lombard) was introduced in May 1999. It was much slimmer and lighter than its predecessor and was the first New World ROM PowerBook. It had longer battery life, and as with the Wallstreet II the user could double the duration to 10 hours by substituting a second battery for the optical drive in the expansion bay.

The keyboard was also improved and now featured translucent bronze-tinted plastics, which is the origin of the "bronze keyboard" nickname. The Lombard was the second PowerBook (the Wallstreet being the first) to use industry-standard ATA optical drives. This change meant that CD and DVD recorders designed for wintel machines could more easily be used in this computer, often at a price far less than those manufactured by Apple.

PowerBook G3 (FireWire, Pismo)

The fourth generation of PowerBook G3 (Pismo), was introduced in February 2000. [13]

The original Pismo was rumored to be a matchless design, akin to the iBook, which is similar in specification. Apple settled on fitting the Pismo board into the form factor of the previous Lombard G3 PowerBook, but with many improvements.

It was also the first PowerBook with AirPort networking as an official option. Brighter screens and replacement batteries were also available.

The Pismo PowerBook was the last of the G3 line and the PowerBook G4 Titanium models succeeded it.

[13] It was code named "Pismo" after the City of Pismo Beach, California.

2000 - Power Macintosh Cube

(PowerMac G4 - iMac G3)

Indisputably it is one of the extraordinary unconventional Apple products. The Power Mac G4 Cube is a small form factor Macintosh personal computer. It was sold from 2000 to 2001. Its cube shape is reminiscent of the NeXTcube from NeXT, acquired by Apple in 1996. Apple industrial designer Sir Jonathan Ive designed this futuristic machine. [14][15]

The small 7×7×7 in (18×18×18 cm) cube, suspended in a 7.65×7.65×10 in (19.4×19.4×25.4 cm) acrylic glass enclosure, housed a PowerPC G4 processor running at 450 or 500 MHz, and had an unconventional vertical slot-loading DVD-ROM or CD-RW drive.

A separate monitor, with either an ADC or VGA connection, was required for the Cube, in contrast to the all-in-one iMac series. Also unlike the iMacs, it had an upgradeable video card in a standard AGP slot. However, there was not enough space for full-length cards. The Cube also featured two FireWire ports and two USB ports for connecting peripherals. Sound was provided by an external USB amplifier and a pair of Harman Kardon speakers. Although the USB amplifier had a standard mini-plug headphone output, it lacked any audio input. The Cube also used a silent, fanless, convection-based cooling system like the iMacs of the time.

Apple targeted the Cube at the market between the iMac G3 and the Power Mac G4, and was the first desktop configuration offering since the discontinued Power Macintosh G3 almost two years earlier.

[14] The New York Museum of Modern Art holds a G4 Cube, along with its distinctive Harman Kardon transparent speakers, as part of its collection.

[15] Sixteen Cubes were used to power the displays of the computer consoles in Star Trek: Enterprise.

(Hint: It's a computer.)

Actually, it's a supercomputer.

Presenting the Power Mac® G4 Cube: a supercomputer miraculously engineered into an eight-inch cube, and suspended in a stunning crystal-clear enclosure.

Though it's less than one quarter the size of most PCs, the G4 Cube delivers far greater performance. Its G4 processor, with built-in Velocity Engine™, reaches supercomputer speeds of over three billion calculations per second – humbling even the fastest Pentium III.® And giving you more than enough power for the most demanding uses, from desktop publishing to desktop movies, from playing ultra-realistic 3D games to playing DVD movies.

Amazingly, we figured out how to cool this enormous G4 power without a fan, making this one of the quietest computers ever built. Running in virtual silence, the G4 Cube doesn't distract you from more important things – like thinking.

It's also the first computer to come standard with an optical mouse, for perfect precision on almost any surface. As well as a pair of Apple-designed Harman Kardon stereo speakers that bring high-fidelity sound to your movies, music and games. And it connects to your choice of Apple's flat-screen or CRT displays in equally stunning designs.

True, it looks like it belongs in the Museum of Modern Art. But the G4 Cube is really a thoroughbred supercomputer that belongs right on your desk.

Despite its innovative design, critics complained it was too expensive. It was initially priced US$200 higher than the comparably-equipped and more-expandable base Power Mac G4 of the time (450 MHz CPU, 64 MB RAM, 20 GB hard drive) and did not include a monitor, thus leading to slow sales. Additionally, early Cubes suffered from a manufacturing issue that led to faint lines (referred to as "cracks" or "mold lines") in the clear plastic case. This was often considered damaging to the aesthetic quality of the computer.

After seeing low profits, Apple attempted to increase sales by bundling more software with it, lowering the price of the base model, incorporating a CD-RW drive standard for the 500 MHz version, and offering an improved Nvidia graphics card as an option. These efforts could not offset the earlier perception of reduced value compared to the iMac and Power Mac G4 lineup. In July 2001 Apple issued a short and slightly unusual press release announcing the product was to be put "on ice".

In 2003, the G4 Cube received a brief return to the spotlight after a series of articles in Wired charted its cult popularity. The articles, focusing on upgrades installed by individual users and retailers such as Kemplar, led to a sharp rise in the Cube's resale value. Nevertheless, with the release of the relatively inexpensive Mac Mini (seen by some as a replacement), coupled with Apple's switch to G5 processors and eventually Intel Core-based processors, the Cube again faded into the background.

2000 - Cinema Display - Desktop Movies
(Studio Display)

The Apple Cinema Display was a line of flat panel computer monitors introduced in September 1999 by Apple Inc. It was initially sold alongside the older line of Studio Displays, but eventually replaced them. In July 2011, Apple introduced its successor, the Apple Thunderbolt Display, and the Cinema Display was no longer offered on the Apple Store website as of August 2014. Apple offered 20-, 22-, 23-, 24-, 27- and 30-inch sizes, with the last model being a 27-inch size with LED backlighting.

There have been three designs for the Cinema Display, one featuring polycarbonate plastic and two featuring anodized aluminium. The first displays were designed to match the colorful plastic of the Power Mac G3 and later the Power Mac G4 while the second revisions were designed to match the more professional aesthetics of the Power Mac G5 and PowerBook G4. The last available design matched the unibody laptops released in October 2008. The newer Thunderbolt Display uses the same design as the 27-inch size Cinema LED Display.

2000 - Powerbook Titanium G4
(Powerbook G3)

The PowerBook G4 is a series of notebook computers that were manufactured, marketed, and sold by Apple, Inc. between 2001 and 2006 as part of its PowerBook line.

The PowerBook G4 had two different designs: one enclosed in a titanium body with a translucent black keyboard and a 15-inch screen; and another in an aluminium body with an aluminium-colored keyboard, in 12-inch, 15-inch, and 17-inch sizes.

Between 2001 and 2003, Apple produced the titanium PowerBook G4; between 2003 and 2006, the aluminium models were produced. Both models were hailed for their modern design, long battery life, and processing power. In addition to the change from titanium to aluminium, the new 15-inch model featured a FireWire 800 port, which had been included with the 17-inch model since its debut nine months earlier.
The PowerBook G4 line was the last generation of the PowerBook series, and was succeeded by the Intel-powered MacBook Pro line in the first half of 2006.

PowerBook G4 (Titanium)
The first generation of the PowerBook G4 was announced at Steve Jobs' MacWorld Expo keynote on January 9, 2001.
The two models featured a PowerPC G4 processor running at either 400 or 500 MHz, housed in a titanium-clad case that was just 1 inch (25 mm) deep. This was 0.7 inches (18 mm) shallower than the G4's predecessor, the PowerBook G3.
The G4 was among the first laptops to use a screen with a widescreen aspect ratio. It also featured a front-mounted slot-loading optical drive. The notebook was given the unofficial nickname "TiBook", after the titanium case and the PowerBook brand name; it was also sold alongside the cheaper iBook.

The initial design of the PowerBook G4s was developed by Apple hardware designers Jory Bell, Nick Merz, and Danny Delulis. The ODM Quanta also helped in the design. The new machine was a sharp departure from the black plastic, curvilinear PowerBook G3 models that preceded it. The orientation of the Apple logo on the computer's lid was switched so it would 'read' correctly to onlookers when the computer was in use. PowerBook G3 and prior models presented it right side up to the computer's owner when the lid was closed. Apple's industrial design team, headed by British designer Jonathan Ive, converged around a minimalist aesthetic, the Titanium G4's design language laid the groundwork for the Aluminum PowerBook G4, the MacBook Pro, the Power Mac G5, the flat-screen iMac, the Xserve, and the Mac mini.

The hinges on the Titanium PowerBook display are notorious for breaking under typical use. Usually the hinge (which is shaped like an L) will break just to the left of where it attaches to the lower case on the right hinge, and just to the right on the left hinge (where the right hinge is on the right side of the computer when the optical drive is facing the user). When the 667 MHz and 800 MHz "DVI"

Powerbooks were introduced, Apple changed the hinge design slightly to strengthen it. At least one manufacturer began producing sturdier replacement hinges to address this problem, though actually performing the repair is difficult as the display bezel is glued together. In addition some discolouration, bubbling or peeling of paint on the outer bezel occurred, notably around the area where the palm would rest while using the trackpad. This appeared on early models but not on later Titanium PowerBooks.

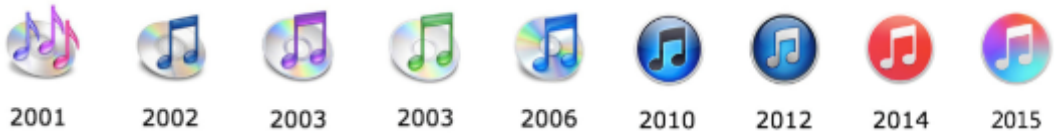
2001 - iMac Patterns
(iMac)

iMac Patterns mark the end of the “colourful era” lived by Apple from 1998 to 2001.

2001 - iBook G3 Snow

With the iBook G3 Snow the previous bold colours and bulky form-factor were abandoned, as were the handle, latch-less design, and additional power connectors on the bottom surface.
The resulting iBook was available in white only (hence the name "Snow"), and incorporated transparent polycarbonate in its casing. It was 30% lighter, and occupied less than half of the volume of the model it replaced, being smaller in all 3 dimensions. Despite that, it added an extra USB port and a higher resolution screen.
With this revision, Apple began transitioning to translucent and white polycarbonate casings in most of its consumer line, such as the iMac and the eMac. In contrast, most of its professional products used an anodized aluminium finish.
Near the end of its run, the Snow iBook G3 case became opaque and white instead of translucent white and magnesium.

2001 / 2003 - iTunes



iTunes represents a step forward the future. This platform will be helpful to create the ultimate Apple product, the iPhone. Steve Job's farsighted idea was to allow people not only buying music but being connect each other and share information all over the world, using applications created even by themselves. Nowadays this fascinating idea has created a new world open to all.

iTunes is a media player, media library, online radio broadcaster, and mobile device management application developed by Apple Inc. It is used to play, download, and organize digital audio and video (as well as other types of media available on the iTunes Store) on personal computers running the OS X and Microsoft Windows operating systems. The iTunes Store is also available on the iPhone, iPad, and iPod Touch.

Through the iTunes Store, users can purchase and download music, music videos, television shows, audiobooks, podcasts, movies, and movie rentals in some countries, and ringtones, available on the iPhone and iPod Touch (fourth generation onward). It is the application software for the iPhone, iPad and iPod Touch and can be downloaded from the App Store.

SoundJam MP

Developed by Bill Kincaid and released by Casady & Greene in 1998, was renamed iTunes when Apple purchased it in 2000. Jeff Robbin, Kincaid, and Dave Heller moved to Apple as part of the acquisition, where they continue to work today as the software's original developers. They simplified SoundJam's user interface, added the ability to burn CDs, and removed its recording feature and skin support.

On January 9, 2001, at Macworld San Francisco, Apple debuted iTunes alongside iDVD and the CD-RW-enabled Power Macs. While it wasn't exactly a show-stopper (though 275,000 copies were downloaded in the first week), the "world's best and easiest to use 'jukebox' software" definitely raised the bar for music players on the Mac, which were relatively sparse and rather pricey (SoundJam cost $40).

By offering iTunes as a free download and installing it on every new Mac, Apple essentially cut down the competition at the pass or at least put a good scare into them. "Apple has done what Apple does best, make complex applications easy, and make them even more powerful in the process," said Steve Jobs at the time. "iTunes is miles ahead of every other jukebox application, and we hope its dramatically simpler user interface will bring even more people into the digital music revolution."

For many Mac users, iTunes was an introduction to digital music, and Apple strived to create a straightforward jukebox that needed little or no instruction to get started. Popping a music CD into your Mac automatically launched iTunes, which loaded the disc, collected track data from Gracenote and added them to your library. A clean interface split into boxes kept everything neat and always within reach of a mouse click.

Conspicuously missing from iTunes 1 was the ability to burn a CD on an external drive, a deficiency compounded by Apple's mostly CD-RW-less line of Macs. Apple answered the cries a month later at Macworld Tokyo with the introduction of new iMacs and Cubes with write-able drives, a 1.1 update that added third-party support, and the launch of the controversial "Rip, Mix, Burn" campaign.

iTunes 2 (Oct. 23, 2001-July 17, 2002)

After racking up more than a million downloads in just a few short months, it quickly became clear that iTunes was every bit as revolutionary as Apple hoped.

In October 2001, Steve Jobs showed us the next piece of Apple's digital hub built exclusively to leverage the popularity of Apple's music app, iPod came bundled with a brand-new version of iTunes that allowed it to seamlessly integrate with the songs and playlists stored on Macs.

Apple also added "the three most requested features" into iTunes 2: MP3 CD burning, a 10-band equalizer and cross fading. A holdover from SoundJam, iTunes' overdue equalizer came preloaded with more than 20.

iTunes 3 (July 17, 2002-April 28, 2003)

Introduced at the final Macworld New York keynote, iTunes 3 was a mostly incremental update with few changes. In the 18 months since its inception, some 14 million copies had been downloaded, and this suggested to Apple adding just enough new features and enhancements.

With iTunes 3 Apple reduced prices, greater capacities and slimmer enclosures made the second-generation iPod even more desirable, but the addition of Windows support was the big change, opening up the popular player to millions of new music lovers.

2001 - iPod 1st gen and followings generations
(iTunes)

In October 2001 Apple launched its first portable music player.
The device that was to revolutionise the music industry had a mechanical scroll wheel and launched with 5GB and 10GB capacities.
The name 'iPod' was coined for use with the Apple music player by copywriter Vinnie Chieco.

The second-generation iPod was characterized by the clunky mechanical scroll wheel and introduced the touch-sensitive version still in use today, albeit in a different form.
Released in July 2002, the new model built on the success of the first incarnation, and came in capacities up to 20GB for £399, with the 5GB model at £259 and 10GB for £329.

With the third-generation iPod, Apple did away with the buttons that surrounded the touch-sensitive wheel, instead setting backlit controls horizontally under the LCD screen.

This edition launched in April 2003 and was the first model to use Apple's 30-pin dock connector. 10GB, 15GB and 30GB models were available, costing £249, £299 and £399 respectively.

The next device wasn't a new version of the existing iPod, but an entirely new model: the iPod mini. The mini launched in January 2004, with 4GB of memory for £199.

The iPod mini came in five snazzy colours and brought with it the first use of the Click Wheel. This iconic and ground-breaking navigation system became ubiquitous within the iPod line until the iPhone was released in 2007, which uses purely gesture-based touch-sensitive control methods.

Mere months later, in July 2004, Apple launched the fourth-generation iPod. Like the mini, the new iPod boasted the Click Wheel, one of Apple's best interface innovations to date.

The fourth-generation model came in 20GB and 40GB capacities, costing £219 and £299 respectively. This model was seen as something of a blow to the iPod mini, as its price, just £20 more than the previous, represented much better value for money in terms of storage. Its significantly larger size attracted a different crowd, however, and so both models existed harmoniously.

Later that year, the iPod Photo was launched. The date was September 2004 and this was the first model to feature a full-colour screen. As the name suggested, the iPod photo was created to store and display photo albums.

The 20GB U2-branded red and black iPod was also unve iled that month, costing £249. It was a monochrome-screen fourth-gen iPod.

January 2005, just one year later, gave birth to the first iPod shuffle.

The shuffle was something of a curiosity: it had no screen, no click wheel and no dock connector. At just £69 for 512MB, however, the shuffle presents itself as a device which could be loved by joggers and young teens everywhere. A 1GB model was also launched at a price of £99.

Over six years later, the shuffle, albeit in a totally new design, still reigns as king of the miniature MP3 players.

Just one month after the shuffle's launch, Apple unveiled the second-generation iPod mini in February 2005.
The new minis had something of a makeover, the colours on offer were much brighter, and the coloured lettering on the Click Wheel now matched that of the iPod's body.
Battery life was also significantly improved (the original mini's battery life was often criticised). A 6GB model was offered for £169, while the original 4GB capacity sold for £139.

In September 2005 was introduced the iPod nano that was vastly superior to its predecessor.
The iPod nano launched in black and white, and 2GB and 4GB capacities, costing £139 and £179 respectively.
Although the nano was generally well received, its easily scratched screen not only caused a consumer outcry, but also sparked a class-action lawsuit against Apple. Apple subsequently shipped protective cases with future models.

In October 2005, Apple unveiled its next full-sized iPod, a model whose form factor has not changed in two full years.
The fifth-generation iPod was the first model to play video and was very well received. It had a larger, sharper colour screen, slimmer form factor and better battery life.
A 30GB video iPod would set you back £219, while a 60GB version would cost you £299. An 80GB version was later released and included, among other things, a library-search feature, and was accompanied by fifth-generation iPod price cuts across the board.

It was over a year before Apple reveiled its next iPod. In September 2006, the second-generation nano was launched.
The new nano had a trendy anodized aluminium casing and came in five colours. Two-gig, 4GB and 8GB models were available at £99, £129 and £169 respectively.

In September 2006 Apple flashed the world with another member: the second-generation iPod shuffle. Shuffle 2.0 came in the form of a clip.
The new shuffle came only in a 1GB version and also present was the anodized aluminium casing and the choice of several colours.

Then, in September 2007 the iPod touch became the 'true' video iPod the world had been dreaming about. It brought the best mobile browsing experience to palms everywhere, offering the iPhone-like iPod experience many people had been holding out for, and eventually got 32GB of memory.

The iPod classic, was also introduced in September. It was essentially a revamped, fifth-generation iPod up to 160GB of storage. A third-generation iPod nano with "a little video for everyone" was also introduced.

The September 2008 was introduced a fourth-generation nano with the original tall form factor of earlier models.
It retained video playback and the same screen as the larger version, but now offered an internal accelerometer, 16GB of memory and the new Genius playlist functionality. It was also the first model to introduce spoken menus for vision-impaired users.

But stealing the show was the new iPod touch, which launched with a new curvy design to match the new iPhone 3G, built-in speakers, a physical volume control (this was a demanded feature), 3D gaming and various other features previously offered as software upgrades, such as Microsoft Exchange email support.

September 2009 brought the arrival of the third-generation iPod shuffle.
It was smaller than ever, but still sporting one massive clip to attach to your polo-shirt sleeve so that everyone knows just how sporty you are.
The lack of a screen still made it difficult to operate but for only £60 for a 4GB model, it was understandably a good seller.

The fifth-generation iPod nano was released in 2009 and packed a larger screen and a video camera.
There wasn't a whole lot of point in the video camera, but it was a fun addition nonetheless, although it oddly didn't take still images as well.
It was available in a rainbow of colours and up to 32GB in size, although the top model would cost a not insignificant £139.

The iPod touch third-generation retained the same look and feel of the previous iteration but boasted improved internal hardware making it much more zippy to use.
Fans of 3D gaming apps were very pleased at the power boost it had received, and the ease of use quickly helped push the touch into the hearts of music-lovers everywhere.
It was available in a 64GB model which was plenty of room for a vast music collection, but you'd have to shell out £300.

2010 saw the advent of the fourth-generation iPod shuffle.
The stretched design of the third-generation had been given an unceremonious boot, to be replaced with the new square version, which naturally still houses a massive clip on the back.
The VoiceOver feature made navigating around your music fairly simple, as did the easy to press buttons on the its colourful face.

A full colour, multi-touch screen was added to the sixth-generation iPod nano.
It is possible to pop it on a wrist-strap and set it to display up to 16 different clock faces.

The 16GB model will set you back £129 and is available in more colours than we knew existed.

The fourth-generation iPod touch was outed in 2010.
This new model packed the gloriously sharp retina display found on the iPhone 4 and also packed a front-facing camera for FaceTime.
It has the same simple operation of previous models and of course full access to the Apple App store.

The fifth-generation iPod touch was shown off in October 2011.
It's not a massive upgrade from the previous model, but it is running Apple's iOS 5, which offers various handy extras such as iMessage and a notification centre for message and alerts.

2002 - iMac G4

(Studio Display - Cinema Display - iBook G3 Snow - Power Macintosh Cube)

The iMac G4 features an LCD display mounted on an adjustable arm above a hemisphere containing a full-size, tray-loading optical drive and a sixteenth-generation PowerPC G4 74xx-series processor.
The arm allows the display to hold almost any angle around the dome-shaped bottom.
The iMac G4 was sold only in white, and was not translucent like the iMac G3. The machine was sold with the Apple Pro Keyboard and Apple Pro Mouse, which would be later redesigned and renamed the Apple Keyboard and Apple Mouse, respectively. Optional Apple Pro Speakers, which were of better quality than the internal speakers, were also available. The Apple Pro Speakers use a unique adapter, designed to work only with a select few Apple Macintosh models.
The iMac G4 originally included both Mac OS 9 and Mac OS X, due to the machine being released the year Mac OS 9 was discontinued.

It was originally known as the The New iMac, while the existing iMac G3 continued to be sold for several months. During this time, Apple had all but eliminated CRT displays from its product line. However, the LCD iMacs were unable to match the low price point of the iMac G3, largely due to the higher cost of the LCD technology at the time. The iMac G3 was obsolete by this point, but low-cost machines were particularly important for the education market. Because of this affordability issue, Apple created the eMac in April 2002 and ended production of the iMac G3. The iMac G4 was then marketed as the "iMac" until its discontinuation then was retroactively labeled iMac G4 to distinguish itself from the succeeding iMac G5 in August 2004.

Apple advertised the iMac G4 as having the adjustability of a desk lamp, and was nicknamed the "iLamp", similar to "Luxo Jr.", who was featured in a short film produced by Pixar, another venture of Apple co-founder Steve Jobs.

One of the advertisements[16] for the machine featured it sitting in a store window "reacting" to every move made by a passer-by on the street. At the end, when the man sticks out his tongue, the iMac responds by opening its optical drive. It was also known as the "Sunflower".

The Gateway Profile was one of the few Wintel competitors to the iMac G4 in the all-in-one LCD computer market. A reviewer noted that the Profile had better processing power, due to its Intel Pentium 4, whereas the iMac was hampered because its G4 chip lacked the 1 MB L2 cache found on the higher-end Power Mac. The iMac had clear advantages in LCD screen quality (it uses a digital LCD as opposed to an analog LCD), ergonomics (particularly the flexible monitor arm), and multimedia. The reviewer concluded that the iMac worked well as an introduction to the Macintosh ecosystem, but noted that their relatively high prices were approaching that of laptops, which are portable and have higher resolution LCD screens.

2002 - Power Macintosh Mirror

(Powermac G4 - Power Macintosh Cube - iBook G3 Snow)

The Power Macintosh G4 (Mirrored Drive Doors) series was dubbed by Apple because of the "mirror finish" on the drive bay doors, but often called "Wind Tunnel" by users referring to its noise.

16

Spot video : https://www.youtube.com/watch?v=AmzPo7RXe6s

2003 - Powerbook G4 Aluminum

(Powerbook Titanium G4 - iBook G3 Snow)

Apple's Industrial Design Group, led by Jonathan Ive, has performed Apple’s industrial design for the last several years entirely in-house.

The early PowerBook G4 models are really made of Titanium. The cases used by early PowerBook G4 models are made of 99.5% pure grade CP1 (commercially-pure) Titanium with a rigid carbon fiber frame. In promotional materials, Apple said that titanium's superior tensile strength and low density give it the greatest strength-to-weight ratio of any of today's structural materials, which enable to build the thinnest and lightest full-featured portable supercomputer on the planet, without having to make the kinds of tradeoffs that would compromise its performance.

However, cases used by PowerBook G4 models starting on January 7, 2003 use less expensive aluminium rather than titanium.

Apple stated that the 12-Inch PowerBook G4 was its "smallest notebook ever", which as some have noted, is true if is measured the volume of the notebook, but compared to the long-discontinued PowerBook Duo 210, the 12" PowerBook G4 is thinner (by 0.22 inches), but it is slightly deeper (by 0.1 inch) and heavier (by 0.4 pounds).

2003 - eMac

(iBook G3 Snow - iMac G4 - iPod 3rd gen)

The eMac, short for education Mac, is a Macintosh desktop computer which was originally aimed at the education market, but was later made available as a cheaper mass market alternative to Apple's second-generation LCD display iMac G4.

It was discontinued by Apple on July 5, 2006 and replaced by a cheaper, low-end iMac that, like the eMac, was originally sold exclusively to educational institutions.

The eMac design closely resembles the first-generation iMac.

Compared to the first iMac, eMacs feature a PowerPC G4 processor that is significantly faster than the previous generation G3 processors, as well as a 17-inch flat CRT display.

Unlike the iMac G3, however, the eMac is not meant to be portable as it weighs 50 lb (23 kg) and lacks a carrying handle.

The eMac generally catered to the mass market, eventually taking over from the soon-to-be-discontinued iMac G3 to become the entry level Macintosh from 2003 to 2005, while the iMac G4 was positioned as a premium offering throughout its lifetime.

The eMac generally offered similar performance and features to the iMac G4 while they were sold side-by-side.

It was gradually supplanted by the iMac G5 in 2005 to 2006.

2003 - iSight
(iPod Mini)

The iSight web-cam was first launched in 2003. To put this product in Apple ecosystem, it existed next to the PowerBook G4 Aluminum, iBook G4 and the iMac G4.
The introduction of iSight coincided with Mac OS X Panther, which introduced iChat AV, bringing video conferencing to iChat. Success of iChat AV depended on the success of iSight, which may be why so much effort was put into this product.

The iSight featured dual microphones for noise suppression, not unlike the systems found in iPhones today. In order to sample ambient noise, the two microphones were spread apart, which was the driving factor for the iSight's long shape. This makes it look like a professional piece of equipment.

The iSight is one of the first Apple products to use aluminium as it primary housing material. The PowerBook G4 was the first to do so in early 2003 and then the iSight and Power Mac G5 followed suit later that year.

The construction methodology is actually quite similar to the iPod mini and this was probably a crucial learning moment that enabled Apple to produce so many iPod minis.

What it is interesting is how iSight has been manufactured: the aluminium housing is a completely seamless tube; a large majority of the product is covered in perforation.
It is simple achieving just one of these, but doing both simultaneously is not. Apple has extruded the tube and then added the perforation as a secondary process. It seems rather unbelievable considering the amount of time it would take to perform the latter.

The Power Mac G5 and the subsequent Mac Pros had a similar aesthetic but they were relatively simple in comparison to manufacture: the holes could be punched out of an aluminium sheet and then bent.

2003 - Mighty Mouse

The Apple Mouse began as one of the first commercial mice available to consumers. Over the years Apple has maintained a distinct form and function with its mice that reflects its design philosophies.

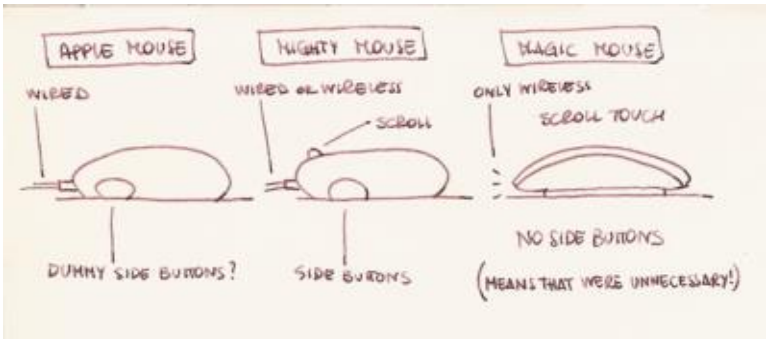
The single most important feature that sets mice manufactured by Apple apart from others is the emphasis on a single button control interface. It was not until 2005 that Apple introduced a mouse featuring a scroll ball and four programmable "buttons."
All mice made by Apple contained a ball-tracking control mechanism until 2000, when Apple introduced optical LED based control mechanisms. Apple's latest mouse uses laser tracking.

In 1979, Apple was planning a business computer and arranged a visit with Xerox Parc research center to view some of their experimental technology. It was there they discovered the mouse, invented by Douglas Engelbart.
The mouse had subsequently been incorporated into the graphical user interface (GUI) used on the Xerox Alto.
During an interview, Engelbart said "SRI patented the mouse, but they really had no idea of its value. Some years later it was learned that they had licensed it to Apple for something like $40,000."
Apple was so inspired by the mouse they scrapped their current plans and redesigned everything around the mouse and GUI.

One of the biggest problems was that the three button Xerox mouse cost over US$400 to build, which was not practical for a consumer-based personal computer.
Apple commissioned Hovey-Kelley Design (which later became IDEO) to assist them with the mouse design, which not only had to be redesigned to cost US$25 instead of US$400, but also needed to be tested with real consumers outside a laboratory setting to learn how people were willing to use it.

Hundreds of prototypes later, Apple settled on a single button mouse, roughly the size of a deck of cards. With the design complete, the operating system was adapted to interface with the single button design using keystrokes in combination with button clicks to recreate some of the features desired from the original Xerox three-button design.

With the single button mouse design established for almost 25 years, the history of the Apple Mouse is basically a museum of design and ergonomics.
The original mouse was essentially a rectangular block of varying beige and gray color and profile for about a decade.
Not much later, it was redesigned to be slightly angular along the top; this mouse is commonly called the "trapezoid mouse" for its slight trapezoid shape on the bottom.
In 1993 Apple redesigned the package to be egg-shaped, which was widely copied throughout the industry. Nevertheless it was still a tool available only in corporate gray or (rarely) black.
With the release of the iMac in 1998 the mouse became available in an array of translucent colors.
Apple also completed the transition to a completely circular design.
Two years later, Apple switched back to a more elliptical shape and monochromatic black and white design.
The rubber ball tracking mechanism was updated with a solid-state optical system, and its single button was moved out of sight to the bottom of the mouse.
Keeping up with the technological trends Apple went wireless in 2003 and two years later, though maintaining its iconic design style, broke its most controversial implementation in the mouse concept and for the first time released a “none button” mouse with five programmable electrostatic sensors and an integrated scroll ball.



Though the Macintosh aftermarket had provided these options to discerning users for decades, Apple itself only made them complementary with its offerings after the passage of much time.

2004 - iMac G5

(iMac G4)

In August 2004, the iMac design was overhauled. By this time, the PowerPC 970 processor had been released and was being used in the Power Mac G5 line.

Famously, the Power Mac G5 needed multiple fans in a large casing because of the high heat output from the PowerPC 970. Apple's new iMac managed to incorporate the PowerPC 970 into an all-in-one design with a distinctive form factor: the computer used the same 17 and 20-inch widescreen LCDs found in the iMac G4, with the main logic board and optical drive now mounted directly behind the LCD panel. This gave the appearance of a thickened desktop LCD monitor.

The approximately two inches deep enclosure is suspended above the desk by an aluminium arm that can be replaced by a VESA mounting plate.

The iMac G5 uses an advanced cooling system controlled by the operating system; at low CPU loads this rendered the iMac G5 virtually silent.

Apple boasted that it was the slimmest desktop computer on the market.

In October 2005, the final revision was released, adding an integrated iSight webcam mounted above the LCD and Apple's Front Row media interface.

Other improvements included faster processors, more RAM, larger hard drives, and improved graphics.

Notably this became the first Apple computer to use the PCI Express expansion bus and DDR2 SDRAM, with these features appearing shortly before they were incorporated into the Power Mac G5. Walt Mossberg of the Wall Street Journal declared it “The Gold Standard of desktop PCs”.

Although the iMac G5 iSight looked outwardly similar to the two previous revisions, it had a slimmer, internally new design. Improvements included superior cooling and performance increases. The stand could no longer be replaced with a VESA mount. This case, unlike the previous models, opened only from the front and requires the LCD screen to be removed before internal components can be accessed. Apple recommend no user serviceable items other than RAM, which is accessible through a small door at the base of the housing. In the intervening years, many guides have been posted on the internet to support replacing other components including the hard drive and optical drive, though doing so voids any remaining Apple warranty.

The iMac G5 was succeeded by the Intel-based iMac on January 10, 2006, beginning the 6-month transition of Apple's entire line of computers to the Intel architecture.

Introduced on the last day of August 2004, the iMac G5 brought G5 muscle to Apple's consumer desktop line. Housed in a completely new enclosure reminiscent of Apple's Cinema Display line, the iMac G5 was a marvel of miniaturization. The case was only two inches thick, yet housed a machine considerably faster and more advanced than its G4-based predecessor.

2005 - Mac Mini

First introduced in 2005, the Mac Mini was the most affordable and compact computer sold by Apple Inc.

It weighed 2.9 lbs., measured two inches in height, and cost $599.

It was the only Apple model that required a display, keyboard, and mouse.

It was geared toward PC users who aimed to transition to a Mac.

Today, the Mac Mini is still sold, and is now the only Apple computer to have an HDMI video port.

2006 - iMac Slimmer Intel - Based
(iMac G5)

At the Macworld Conference and Expo on January 10, 2006, Steve Jobs announced that the new iMac would be the first Macintosh to use an Intel CPU, the Core Duo.

The features, price, and case design remained unchanged from the iMac G5. The processor speed, however, according to tests run by Apple using SPEC, was declared to be two to three times faster than the iMac G5.

The current Apple iMac features either an Intel Core i5 or Core i7 processor, Intel Iris, Nvidia GeForce 700 Series, or AMD Radeon R9 M200 Series graphics cards, and a choice of either a 21.5" or 27" LED-LCD display.

2006 - iMac Intel Core Duo
(iMac Slimmer Intel - Based)

The Apple iMac "Core Duo" 2.0 20-Inch uses essentially the same all-in-one enclosure as the iMac G5/2.1 20-Inch (iSight) that preceded it, and likewise, has the entire computer tucked discreetly behind the flat-panel display.
However, the iMac "Core Duo" 2.0 20-Inch replaces the PowerPC G5 processor with an Intel "Core Duo" processor, which makes it a member of the the first desktop Mac series to be powered by Intel.

2006 - MacBook

(iMac Intel Core Duo - iBook G3 Snow)

Apple replaced the iBook line with the MacBook in May 2006 during Apple's transition to Intel processors. The MacBook has also evolved into different models, such as the MacBook Pro targeting high performance and the MacBook Air targeting the entry level, consumer ultrabook-market.

The MacBook is a brand of notebook computers manufactured by Apple from early 2006 to late 2011, and launched in 2015.

It replaced the iBook series and 12-inch PowerBook series of notebooks as a part of the Apple-Intel transition from PowerPC. Positioned as the low end of the MacBook family, below the premium ultra-portable MacBook Air and the powerful MacBook Pro, the MacBook was aimed at the consumer and education markets.[17]

There have been four separate designs of the MacBook. The original model used a combination of polycarbonate and fiberglass casing, which was modeled after the iBook G4.

The second type was introduced in October 2008 alongside the 15-inch MacBook Pro; the MacBook shared the more expensive laptop's unibody aluminium casing, but omitted FireWire, which hurt sales.

A third design, introduced in late 2009, had a polycarbonate unibody casing and no FireWire ports.

On July 20, 2011, the MacBook was quietly discontinued for consumer purchase as it had been effectively superseded by the MacBook Air whose starting price was lowered.

Apple continued to sell the MacBook to educational institutions until February 2012.

A new, redesigned MacBook line was launched on March 9, 2015. Available in silver, gold or space grey, it is thinner than the MacBook Air and removes the traditional MagSafe charging port (along with all other ports, except the headphone port) in favor of the multi-purpose USB Type-C port.

Original polycarbonate model

The original MacBook, available in black or white colors, was released on May 16, 2006, and used the Intel Core Duo processor and 945GM chipset, with Intel's GMA 950 integrated graphics on a 667 MHz front side bus. Later revisions of the MacBook moved to the Core 2 Duo processor and the

[17] It was the best-selling Macintosh ever. For five months in 2008, it was the best-selling laptop of any brand in US retail stores. Collectively, the MacBook brand is the "world's top-selling line of premium laptops."

GM965 chipset, with Intel's GMA X3100 integrated graphics on an 800 MHz system bus. Sales of the black polycarbonate MacBook ceased in October 2008, after the introduction of the aluminium MacBook.

While thinner than its predecessor -- the iBook G4 -- the MacBook is wider than the 12-inch model due to its widescreen display.

In addition, the MacBook was one of the first (the first being the MacBook Pro) to adopt Apple's MagSafe power connector and it replaced the iBook's mini-VGA display port with a mini-DVI display port.

While the MacBook Pro largely followed the industrial design standard set by the PowerBook G4, the MacBook was Apple's first notebook to use features now standard in its notebooks (the glossy display, the sunken keyboard design and the non-mechanical magnetic latch).
With the late 2007 revision, the keyboard received several changes to closely mirror the one which shipped with the iMac, by adding the same keyboard short-cut to control multimedia, and removing the embedded numeric keypad and the Apple logo from the command keys.

A more expensive black model was offered until the introduction of the unibody aluminium MacBook. The polycarbonate MacBook was the only Macintosh notebook (until the new 2015 model) to be offered in more than one color since the iBook G3 (Clamshell).

Late 2006 - MacBook
(MacBook)

The Apple MacBook "Core 2 Duo" 2.0 13-Inch (Black) features a 2.0 GHz Intel "Core 2 Duo" processor (T7200), with two independent processor "cores" on a single silicon chip.

The MacBook "Late 2006 Core 2 Duo" series shares the same easy to upgrade case design as the original MacBook models, and connectivity likewise includes AirPort Extreme, Bluetooth 2.0+EDR, Gigabit Ethernet, a FireWire "400" port, two USB 2.0 ports, optical digital audio in/out, and video out capabilities (mini-DVI) that supports an external display.

The MacBook "Late 2006 Core 2 Duo" and original "Core Duo" models also share the same "scrolling TrackPad", built-in iSight video camera, Apple Remote for use with Apple Front Row software,

"MagSafe" power connector, "flush against the bed" keyboard that does not touch the screen, and "no moving parts" magnetic latch that "catches without a catch".

2006 - MacBook Pro
(PowerBook Titanium G4 - iMac Intel Core Duo)

Apple began shipping the MacBook Pro (MBP) with faster CPUs than originally announced.
This is the first time in Apple history that a computer has been released with a faster CPU than originally announced, and it's also the first time Apple has offered a faster CPU as a build-to-order option in a notebook.
Apple marked the transition to Intel by discontinuing the well-known, long-respected PowerBook name.

Built around Intel's Core Duo CPU, the new 'Book offers up to 4x the performance of the old one.
The new MacBook Pro looks a lot like the old 15" PowerBook G4 at first glance, but its 15.4" 1440 x 900 display is the brightest Apple has ever used on a notebook. It is a bit larger and thinner than the 15″ PowerBook G4.

There are two other visual clues that this 'Book is different. There's a black square above the display for the iSight webcam. And there's a round spot on the front, a receiver that works with Apple's remote.

New with the MacBook Pro is the MagSafe power connector, which is designed to detach itself when someone trips over the cord, thus preventing your 'Book from crashing to the floor.'

2006 - Mac Pro
(iSight - PowerMac G5 - iMac Intel Core Duo)

Announced at WWDC in August 2006, the Mac Pro completed Apple's transition to Intel processors, replacing the PowerMac G5 (Late 2005) as Apple's professional desktop Mac.
The Mac Pro was based on two 64-bit, dual-core Intel Xeon 5100 "Woodcrest" processors, which included a 128-bit Vector Engine. The Mac Pro's case resembled its PowerMac predecessor's--with the

exception of a second optical drive bay--but the interior of the case was completely redesigned. The Xeon processors required less heat-dissapation than G5 processors, allowing a smaller cooling system. The Mac Pro had four easily accessible hard drive bays (for a BTO maximum of 2 TB of storage) and easy access to its 8 RAM slots, which allowed for a Maximum of 16 GB of RAM.

2007 - MacBook
(MacBook 2006)

While the 2006 debut of Apple's MacBook line was flat-out revolutionary--introducing Intel's Core 2 Duo CPUs and a 13.3-inch wide-screen display along with Apple's iSight camera, Front Row remote, and MagSafe power adapter--the May 2007 upgrade is more evolutionary. The overall design remains unchanged, as Apple bumped up the top processor speed to 2.16GHz and the default memory to 1GB for all three configurations while also adding larger hard drives. Eagerly awaited upgrades, such as Intel's new Centrino Duo platform, LED-backlit displays, or solid-state hard drives are still MIA, but more power for the same price is always welcome.

2007 - Apple TV 1st gen
(Mac Mini - iTunes)

The announcement of the Apple TV came at a time when Apple unveiled the iPhone and officially changed the company name from Apple Computer to Apple Inc., a move that indicated Apple's seriousness in focusing more on lifestyle products for the general consumer than on traditional computers.

Apple TV was unveiled as a work-in-progress called "iTV" on

September 12, 2006 using a modified Front Row interface using the Apple Remote. Apple started taking pre-orders for Apple TV on January 9, 2007.

The name "iTV" was originally going to be used to keep it in line with the rest of their "i"-based products (iMac, iPod, etc.), but was not used because television broadcaster ITV holds the rights to the name in the UK and threatened to take legal action against Apple.
Apple TV started shipping on March 21, 2007 with a 40 GB hard disk. Apple released a 160 GB model on May 31, 2007; and ceased selling the 40 GB version from September 14, 2009.

On January 15, 2008, a major (and free) software upgrade was announced, that turned the Apple TV into a stand-alone device that no longer required a computer running iTunes on Mac OS X or Windows to stream or sync content to it, and making most of the Apple TV's hard disk redundant. The update allowed the device to rent and purchase content directly from iTunes Store, as well as download podcasts and stream photos from MobileMe (.Mac at the time) and Flickr.

On July 10, 2008, Apple released the iTunes Remote app on the App Store, and the Apple TV 2.1 software update that added recognition for the iPhone and iPod Touch as remote control devices intended as a software alternative to the Apple Remote. Later updates to the Apple TV, iTunes and Remote software added support for the iPad, and introduced support for new features as they were added to iTunes.

2007 - iPhone EDGE
(iTunes - iPod Touch)

The history of the iPhone starts with the implementation of the multi-touch screen on phones.
'Duncan showing us how, with multi-touch, you could do different things with two fingers and with three fingers', recalled Satzger. He showed us on-screen rotating and zooming - and I was really surprised that we could do that stuff.'
It was the first time the Apple team had even heard of multi-touch. Today it does not seem exceptional, but back then, touch interfaces were pretty primitive. Most touch devices, such as Palm Pilots and Windows tablets, used a pen or stylus. Screens that were sensitive to fingers, not pens, like ATM screens, were restricted to single presses. There was no pinching or zooming, no swiping up and down or left and right. Duncan Kerr explained to his colleagues that the new technology would allow

people to use two or three fingers instead of just one, and that it would afford much more sophisticated interfaces than simple single-finger button presses.
'Touch is one thing, but multi-touch was new. You could swipe to turn a page, as opposed to finding a button on the screen that would allow you to turn the page.
Instead of trying to find a button to make operations, we could turn a page just like a newspaper'. (Satzger)

Jony Ive in particular had always had a deep appreciation for the tactile nature of computing; he had put handles on several of his early machines specifically to encourage touching. But here was an opportunity to make the ultimate tactile device.
No more keyboard, mouse, pen or even a click wheel - the user would touch the actual interface whith his or her fingers. This is more intimate.

Building a finger-controlled tablet looked like a real possibility. It wouldn't happen overnight and, thanks to market forces, another revolutionary Apple product would emerge from the pipeline first.

Model 035

The marketplace didn't see multi-touch products until the late 1990s. Among the first were a gesture-based input pad for computers and a touch-sensitive keyboard-cum-mouse, from a small Delaware company called FingerWorks.
Early in 2005, Apple quitely acquired FingerWorks and immediately pulled its products from the market.

One of the prototypes they created, known internally as 'Model 035', formed the bases for a patent filed on 17 March 2004.
Model 035 was a large, white tablet that looked like the lead of one of Apple's white plastic iBooks from the time. Though it lacked a keyboard, it was based on iBooks components.

While Jony's team worked on several tablet prototypes, Apple's executives were worrying about the iPod.
It was flying high: Apple sold two million in 2003, ten million in 2004, and forty million in 2005.
But it was becoming clear that the mobile phone would one day supersede the iPod.

Most people were carrying around both an iPod and a mobile. At that stage, mobile phones could store a few tunes, but it was becoming clear that, sooner rather than later, someone, perhaps a competitor, would combine the two devices.

During an appearance at the 2010 All Things Digital conference, Jobs took credit for having come up with the idea for a touch-screen phone.
' I'll tell you a secret ', Jobs told the crowd. ' It began with the tablet. I had this idea about having glass display, a multi-touch display you could type on with your fingers. I asked our people about it. And six months later, they came back with this amazing display. And I gave it to one of our really brilliant UI (User Interface) guys. He got scrolling and some other things, and I thought "My God, we can build a phone with this!". So we put the tablet aside, and we went to work on the iPhone '.

Years later, Apple attorney Harold McElhinny would describe the immense amount of work the project required. ' It required an entirely new hardware system, it required an entirely new user interface and that interface had to become completely intuitive. '
He also said Apple took a huge leap of faith moving into a new product category. ' Think about the risk. They were successful computer company. They were a successful music company. And they were about to enter a field that was dominated by giants. Apple had absolutely no name in the [phone] field. No credibility. '

To mitigate the risk, Apple's executives hedged their bets. They would develop two phone in parallel and pit them against each other. The secret phone project was code-named Purple, shortened to just 'P'. One phone project, based on the iPod nano, got the code name P1; the other phone led by Jony was a brand new multi-touch device based on the 035 tablet, code-named P2.

The P1 project was led by Fadell; his group had the the idea to somehow graft a phone onto a current iPod.
'Nobody in the company knew we were working on a phone', said Rogers. It was also a lot of extra work. At the time, the iPod team was also working on a new iPod nano, a new iPod classic and a Shuffle.
Fadell's team produced a prototype iPod-plus-phone that worked, more or less. One of the characteristics was that the iPod click wheel was used as a dialler, selecting numbers one at a time like an old rotary phone.

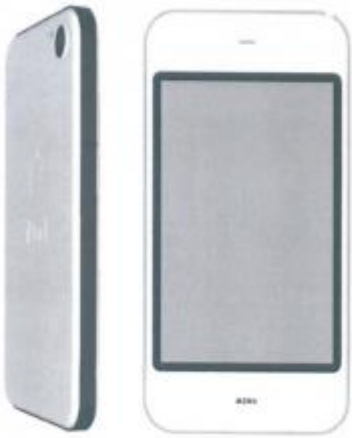
P1 device was too limited. It couldn't surf the Net; it couldn't run apps. It didn't represent the premise to new world led by iPhone. [18]
After six months of work on the iPod-plus-phone P1, Jobs killed the project.

After the decision to move forward with the P2, Jony was put in charge of industrial design, Fadell of engineering and Forstall, previously responsible for Mac OS X, was given the job of adapting the computer operating system into a brand-new operating system for the phone.

Jobs told the executives they could recruit anyone they wanted within the company to work on the project, but they absolutely could not go outside.
An entire floor in one of the buildings at Apple HQ was dedicated to the project, its name was the 'Purple Dorm'.
' People were there all the time ', Forstall said. ' They were there at night. They were there on weekends. '
' On the front door of the Purple Dorm we put a sign up that said Fight Club because the first rule of Fight Club in the movie is you don't talk about Fight Club, and the first rule about the Purple project is you do not talk about that outside of those doors. '

Jony explained it was all about how the user would feel about the device. ' When we are at these early stages in design, when we're trying to establish some of the primary goals we're talking perception. We're talking about how you feel about the product, not in a physical sense, but in a perceptual sense. '

Jony believed the iPhone would be all about the screen. The designers agreed that nothing should detract from the screen, which Jony likened to an 'infinity pool', those high-end swimming pools with an invisible edge.
Jony said they wanted the display to be magical and surprising. These were his high-end goals for any eventual design.



[18] Two years later, during the iPhone introduction at Macworld, Jobs jokingly flashed an image of an iPod with a rotary dial pad on its screen.
This was how to not to build a new phone, Jobs said, as the audience laughed. Few knew the company might well have produced just such a phone.

The Jony Phone

After the development of two prototypes (Extrudo and Sandwich, whose style prevailed), Jony's team turned to an old model they'd made early in the process. The discarded model looked very similar to the phone that actually ship, with an edge-to-edge screen interrupted only by the single home button.
Its gently curved back snapped seamlessly onto the screen, like the original iPod. Most importantly, it maintained Jony's infinity-pool illusion.
When the phone was off, it appeared to be a single, unbroken, inky-black faceplat; when switched on, the screen magically appeared from within.
It was a voila! moment. ' We found something that we'd overlooked ', said Stringer, ' something that we, once adding detail to it and really spending some time with it, decided was the absolute best choise for us at that time'.

The front face bore neither the company logo nor the name of the product. ' We also knew from our experience with iPod ', Stringer explained, ' if you make a startlingly beautiful e original design, you don't need to. It stands for itself. It becomes a cultural icon. '

Beyond matters of form, the team focused on the function of the multi-touch. Most touch devices at the time used resistive touch screens, based on two thin sheets of conductive material conductive separated by a thin gap of air.
When the screen is pressed, the two layers make contact, registering the touch. Resistive screens were typically made of plastic, and were common in pen-based devices like Palm Pilots and Apple's Newton.

Jony's design team tried using a resistive screen for the iPhone, but were unsatisfied with the results. Pressing on the screen distorted the picture, and the screen tired the fingers because the user had to press pretty hard.

Moving on from the resistive screen, the hardware team set out to build screens based on capacitive touch, registering changes in electrically charges across its surface. Human skin is electrically conductive, and a capacitive touch-screen uses that characteristic to detect even the lightest touch.
Apple had been using capacitive touch technology for several years with the iPod scroll wheel, laptop track pads and Power Mac Cube, which had a capacitive on-off button.
But the technology hadn't been applied to transparent screens.

One problem was that there was no supply chain for capacitive screens. No one was producing them on an industrial scale at the time - but Apple found a small company in Taiwan called TPK that was producing them for point-of-sale displays using an innovative but limited-run technique.
Jobs made a handshake deal with the company, promising that Apple would buy every screen the factory could produce. Based on this agreement, TPK invested $100 million to rapidly ramp up their manufacturing capabilities. They ended up supplying about 80 per cent of the screens for the first iPhone, growing rapidly to a $3 billion business by 2013.

Countdown to Macworld

Just weeks before Macworld, Jony's team had a prototype that worked well enough to show AT&T. In December 2006, Jobs travelled to Las Vegas to show it to the wireless carrier's CEO, Stan Sigman, who was ' uncharacteristically effusive ', calling the iPhone ' the best device I have ever seen. '

The arrival of the iPhone at Macworld was the culmination of more than two and a half years of intense hardship, learnign and dedication to bring it to market.

When launch day came in mid-summer 2007, Jony joined the whole design team at the flagship Apple retail store in San Francisco. ' We had something new. There was an incredible buzz. And there was an enormous crowd outside. We wanted to feel that enthusiasm and see people, see their eyes when they get these new products, the first people to get them. When the doors opened, there was mayhem. It was like a carnival. '

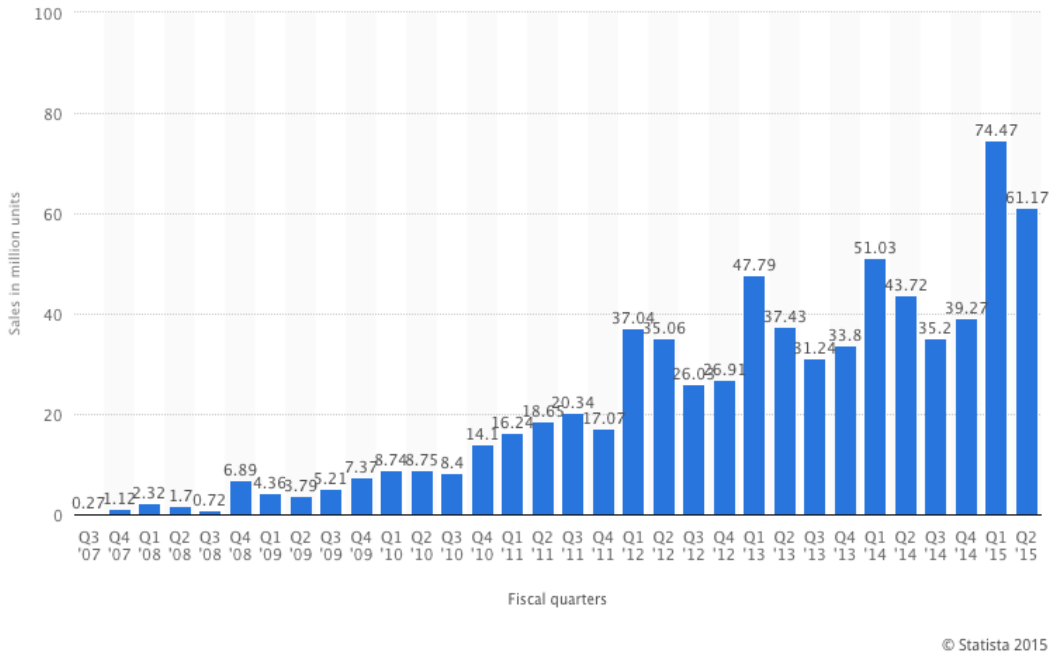
Stringer was overwhelmed with emotion. ' We were obviously very, very proud. We'd worked really hard. It was - there was an enormous number of people that put in personal sacrifice and it was paying off in spades. It was a beautiful day. '

Financial data

The iPod had been regarded by a lot of pundits as Apple getting lucky, a fluke, a one-shot.
When Apple entered the cut-throat mobile phone market, it was predicted the iPhone would flop. Microsoft's Steve Ballmer famously said it would never get any market share. But the iPhone was a hit from the start, and Apple used its old playbook of rapidly adding features and models.

Apple released the iPhone in mid-2007. By the end of the year, 3.7 million iPhones had been sold. By the first quarter of 2008, the sales volume of iPhones exceeded sales of Apple's entire Mac line. And by the end of 2008, the company was selling three times as many iPhones per quarter as it was selling Macs. Revenue and profits were through the roof.

The bar chart below [19] shows Apple iPhone sales worldwide from the third quarter of 2007 to the company's more recent financial quarter.



In the second quarter of 2011, 18.65 million iPhones were sold worldwide. In the 2011 fiscal year, Apple sold 72 million iPhones.

Since its market introduction, Apple has released a new generation of iPhones each year. The models that followed the first generation are the iPhone 3G (July 2008), the iPhone 3GS (June 2009), the iPhone 4 (June 2010), the iPhone 4S (October 2011), the iPhone 5 (September 2012), the iPhone 5C / 5S (September 2013) and the iPhone 6 (September 2014). All iPhone models run Apple's own mobile operating system iOS.

Sales of the iPhone have risen strongly over the years, from around 1.4 million iPhones sold in 2007 to almost 170 million units worldwide in 2014. In total, Apple has sold more than 590 million new

[19] Fig. Global Apple iPhone sales from 3rd quarter 2007 to 2nd quarter 2015 (in million units), from Statista 2015, 2015.

iPhones from 2007 to 2014 all around the world. In 2013, Apple has held a market share of 15.3 percent of new smartphone sales worldwide.
Apple is considered to be among the most valuable brands in the world, according to Milward Brown, and generates billions of dollars in revenue each year. Other notable Apple products are the iMac, the MacBook, the iPod and Apple TV.

Curiosity
When Jobs unveiled the iPhone at Macworld in January 2007, he invited his old friend Alan Kay to the launch. Jobs and Kay knew each other from Xeroc PARC, and later Kay had been appointed an Apple fellow, a kind of elder statesman, and worked for a decade inside Apple's Advanced Technology Group in the late 1990s. Kay is famous for prophesying the 'Dynabook', a tablet computer that would provide a window into all the world's knowledge - back in 1968.

On iPhone launch day, Jobs turned to Kay and casually asked, 'What do you think, Alan? It is good enough to criticize?' The question was a reference to a comment made by Kay almost twenty-five years earlier, when he had deemed the original Macintosh 'the first computer worth criticizing'. Kay considered Jobs question for a moment and then held up his moleskin notebook. "Make the screen at least five inches by eight inches and you will rule the world," he said.
The world would not have to wait very long for the iPad.

2007 - iMac Aluminum (Intel Based)
(iMac G5 - iMac Intel Core Duo)

In August 2007, Apple introduced an all new all-in-one iMac line featuring 20- and 24-inch widescreen displays encased in aluminium and glass enclosures.
The entire new iMac line features the latest Intel Core 2 Duo processors and a new, ultra-thin aluminium Apple Keyboard, built-in iSight video camera for video conferencing and iLife ’08, making it the ultimate digital lifestyle desktop computer for both consumers and professionals.

“This new iMac is the most incredible desktop computer we’ve ever made,” said Steve Jobs, Apple’s CEO, in the press release.

Redefining Apple’s signature all-in-one design, the new iMac integrates the entire computer system into a sleek aluminium enclosure for a striking, clutter-free desktop. An elegant glass cover joins precisely to the aluminium enclosure creating a virtually seamless front surface.
The new ultra-thin aluminium Apple Keyboard is just 0.33 inches thin at its front edge.
A new optional Apple Wireless Keyboard is a compact design that, with Apple’s wireless Mighty Mouse, offers a cable-free desktop.

Every iMac also includes iLife ’08, the most significant update ever to Apple’s award-winning suite of digital lifestyle applications, featuring a major new version of iPhoto and a completely reinvented iMovie, both seamlessly integrated with the new. Mac Web Gallery for online photo and video sharing.
The new iMac’s 20- and 24-inch glossy widescreen displays provide incredibly crisp images, ideal for photos and movies using the all new iLife ’08 suite of digital lifestyle applications that are included.

The new iMac, with its stunning design, features highly recyclable and durable materials including scratch-resistant glass and professional grade aluminium.
The power-efficient iMac also meets the stringent new Energy Star 4.0 requirements, as we know from a press release with Steve Jobs, “Our new design features the innovative use of materials, including professional-grade aluminium and glass, that are highly recyclable."

2008 - iPhone 3G
(iPhone EDGE)

The iPhone 3G added 3G cellular network capabilities and A-GPS location.

The iPhone 3G features the same 3.5" display with 320x480 resolution at 163 ppi, but uses a slightly thicker case, with either a black or white plastic back, rather than aluminium like the original model. It includes 8 GB or 16 GB of storage (white model only available with 16 GB), support for Wi-Fi, and an intergrated 2.0 megapixel camera that supports "geotagging".
Apple reports that the iPhone 3G provides "up to" 24 hours of audio playback, 10 hours of talk time on 2G, 5 hours of talk time on 3G, 5 hours of Internet use on 3G, 6 hours of Internet use on Wi-Fi, 7 hours of video playback and 300 hours of standby time.
The iPhone 3G uses the same "multi-touch" interface, as well as accelerometer, ambient light, and proximity sensor capabilities as the original model, although it has two proximity sensors compared to one in the original.

2008 - MacBook Air
(iMac Aluminum Intel Based - iPhone 3G)

Apple took a completely different approach to ultralight notebook computers with the MacBook Air (MBA). Where netbooks used small screens, shrunken keyboards, and underpowered CPUs, Apple has gone very, very thin so the MacBook Air can have a 13.3″ LED backlit display, a full-sized keyboard, and a 1.6 GHz Core 2 Duo CPU – along with up to 5 hours of battery life without turning off AirPort.

New to the MacBook line is a large multitouch trackpad, which lets MacBook Air users do the same kind of things iPhone users can. The MacBook Air uses a special version of the Core 2 CPU that’s 60% smaller than usual.

The MacBook Air is Apple’s first computer to support wireless NetBoot, and the Remote Disc software that comes with the MBA (on CD) can turn a Mac or Windows PC into a NetBoot server, allowing access to that computer’s optical drive from the MBA even for reinstalling the operating system.

The MacBook Air has the same footprint as the MacBook, but it’s 2.2 lb. lighter and was the first Mac with a unibody aluminium design.

2009 - iPhone 3GS
(iPhone 3G)

The iPhone 3GS is the third generation iPhone, successor to the iPhone 3G. It was introduced on June 8, 2009, at the WWDC 2009 which took place at the Moscone Center, San Francisco.
This iPhone is named "3GS" where "S" stood for Speed (Phil Schiller had mentioned it in the launch keynote).
Improvements include performance, a 3-megapixel camera with higher resolution and video ability, voice control, and support for 7.2 Mbit/s HSDPA downloading.
It was released in the U.S., Canada and six European countries on June 8, 2009, in Australia and Japan on June 27, and internationally in July and August 2009.

The iPhone 3GS runs Apple's iOS operating system. It is controlled mostly by a user's fingertips on a multi-touch display. It was succeeded as Apple's flagship smartphone in 2010 by the iPhone 4; however, the 3GS continued in production until September 2012 when the iPhone 5 was announced.

The new features of the iPhone 3GS are mainly internal changes regarding speed. The iPhone 3GS is speedier and is 2x faster than its predecessor. Though in addition to the upgrades mainly regarding performance, various software features were also introduced exclusive to the iPhone 3GS such as Video Camera, Voice Control and Digital Compass. All of its exclusive features were incorporated into the iPhone 4.

2009 - iMac

(iMac Aluminum Intel Based - iPhone EDGE - MacBook Air Unibody)

The Late 2009 iMac comes in 21.5″ and 27″ sizes, and the displays have the same 16:9 aspect ratio as HDTV (the Early 2009 iMac had 20″ and 24″ 16:10 aspect ratio displays). The smaller iMac has the same 1920 x 1080 pixel size as 1080i high-def television, and the 27″ beastie provides an incredible 2560 x 1440 pixels.

Both sizes are LED backlit, and the 27″ iMac also has Mini DisplayPort input, allowing another computer or video device (DVD or Blu-ray player) that supports DisplayPort to use the iMac's screen (it's not compatible with HDMI, DVI, or VGA). One feature new to Apple's desktop line is a built-in SD Card slot, which is on the right side below the SuperDrive.

Visually, the screen looks even bigger, as the glass now goes all the way to the edge of the computer – no more aluminium border around the display. And the back is now aluminium instead of black plastic.

2009 - MacBook White Unibody

(MacBook 2006 - MacBook Air Unibody - iPhone 3G)

The MacBook "Core 2 Duo" [20] (White Polycarbonate "Unibody" - Late 2009) unveiled a new "glossy white unibody" case design, modeled after the previously introduced "Unibody" MacBook and MacBook Pro models, but uses polycarbonate rather than aluminium and has a "non-skid" rubberized bottom surface.

Its colour recalls the white plastic back of iPhone 3G and the colour and material used for its predecessor, MacBook 2006, and iMac G4 which was sold only in white colour.

Like the aluminium "Unibody" models, this system also has a four-finger "multi-touch" glass trackpad and an integrated battery design that is not intended to be replaced by the end user. Apple reports that this battery design increases runtime, and as a result, this model provides "up to" 7 hours compared to 5 hours for the model it replaced.

2010 - iPhone 4

(iPhone 3Gs - iPod 4th gen)

The iPhone 4, heralded as the "biggest leap since the original iPhone," uses an all stainless steel body design with an ultra high-density 3.5-inch, IPS, LED-backlit 960x640 326 ppi multi-touch "retina" display, mobile and data antennas integrated in the "metal band" that wraps around the sides of the phone, and a chemically hardened "aluminosilcate" glass front over

[20] 2.26 13-Inch.

both the display and a black frame and the chemically hardened black glass back as well (it was introduced with a white option on June 7, 2010, too, but this version did not ship until April 28, 2011). Regardless of color, both the front and back have an "oleophobic" oil repellent coating.

It has dual cameras -- a 5 megapixel HD video/still camera (720p at 30 FPS) with a "backside illuminated sensor," a 5X digital zoom, and an LED flash on the rear and a VGA quality video/still camera on the front designed for video conferencing over a Wi-Fi network with Apple's included "FaceTime" application. It has dual noise-cancelling microphones also.

It is powered by an "Apple A4" processor of unspecified speed, has 512 MB of RAM, and has 8 GB, 16 GB, or 32 GB of internal storage (8 GB configuration introduced October 4, 2011). Network support includes UMTS/HSDPA/HSUPA (850, 900, 1900, 2100 MHz) and GSM/EDGE (850, 900, 1800, 1900 MHz). 802.11g/n and Bluetooth 2.1+EDR are supported as well.

Like the iPhone 3GS that came before it, the iPhone 4 includes a digital compass, A-GPS, and an accelerometer, but adds a 3-axis gyroscope to its list of sensors for additional 3D gaming options.

Apple reports that the iPhone 4 provides "up to" 40 hours of audio playback, 14 hours of talk time on 2G, 7 hours of talk time on 3G, 6 hours of Internet use on 3G, 10 hours of Internet use on Wi-Fi, 10 hours of video playback and 300 hours of standby time.

2010 - Apple Tv 2nd gen
(Apple Tv 1st gen)

The second generation Apple TV was unveiled on September 1, 2010.
The device was now housed in a very small all-black case, about ¼ the size of the original. The new model did away with an internal hard drive and had an internal 8 GB flash storage, enough local storage for buffering purposes; all media was now streamed, instead of synced.
The new device could also stream rented content from iTunes and video from computers or iOS devices via AirPlay. All content is drawn from online or locally connected sources.
In July 2011, Apple discontinued the Front Row interface.

2010 / 2011 - iPad - iPad 2

(eMate - iPhone 4 - MacBook Air Aluminum)

'Steve never lost his desire to do a tablet,' said Phil Shiller. While Jony's design team was developing the iPhone, they were also actively working on tablets. Jobs was just waiting for the right time to bring a tablet to market.

One incentive to move forward was the appearance of netbooks, a category of small, inexpensive, low-powered laptops that launched in 2007. They quickly started to eat into laptop sales and, by 2009, netobooks accounted for 20 per cent of the laptop market. 'Netbooks aren't better than anything,' Steve Jobs said at the time.

During one such high-level executive meeting in 2008, Jony proposed that the tablets in his lab could be Apple's answer to the netbook. Jony suggested that a tablet was basically an inexpensive laptop without the keyboard. The idea appealed to Jobs, and Jony was given the go-ahead to transform the prototypes into a real product.

Crucially, mobile technology had advanced significantly in just a few years since the iPhone had been launched. By then, the 035 tablet prototype from 2004 seemed big and unwieldy.

Jony began by ordering twenty models made in varying sizes and screen-aspect ratios. They were laid out on one of the studio's project tables for Jony and Jobs to play with.

'That's how we nailed what the screen size was,' Jony has said.[21]

The screen size was also strongly influenced by a simpler piece of equipment: a standard piece of paper. According to an executive at Apple at the time it was conceived as a legal note tablet, and it was the right size. It was targeted at education and schools and e-reading.

Jony's ultimate goal was to make a device that needed no explanation and was fully intuitive. It was to be a 'breathtakingly simple, beautiful device, something that you really want, and something that's very

[21] They had done the same thing earlier in finding the right size for the Mac mini and other products.

Steve and Jony used to do that with almost all products. They started off making a bunch of "appearance" models and they'd make them in all sorts of sizes to find what they want.

easily understandable, ' Stringer said. ' You pick it up, you use it, something that... needs no explanation.'
That said, producing the 'breathtakingly simple' can require an immense investment of time and creative energy.

Jony's design team explored two different design directions for the iPad, directly akin to the twin design directions they pursued with the iPhone: Extrudo and Sandwich.

The Extrudo design lead on this version was Chris Stringer, who also worked on the Extrudo iPhone. As with the phone designs, Stringer's Extrudo iPad was a made of a single piece of extruded, milled aluminium.

Jony's IDg team experimented with some 'picture frame' models, which had kickstands to prop them up. (Kickstands would also feature prominently in competing tablets from Microsoft and other manufacturers in the future.) Jony's team didn't pursue the idea, although adding a kickstand would appear later in the iPad 2's magnetic cover, which could be folded back into a stand.

The designers found Stringer's Extrudo iPad suffered the same limitation as the Extrudo iPhone: the bezel detracted from the screen. Jony wanted the infinity-pool illusion because he understood the screen was all-important and that nothing should detract from it.

Richard Howarth brought his experience with the Sandwich iPhone models to his prototypes, making several versions of Sandwich-style iPads. The early Sandwich iPad models resembled more svelte versions of the 035 prototype. Made of shiny white plastic with a boxy shape, they are clearly in the same design family as Apple's plastic MacBooks, released early in 2006 - which makes sense given that they were designed largely by Howarth. Like the plastic MacBook, the device at that point remained fairly big and chunky. Still, Jony's team was clearly homing in on how to present the screen, and the bezel was plain and unobtrusive.

Jony spotted the problem. The iPad needed a cue, some sign that it was friendly and could be picked up easily with just one hand. As usual, Jony wanted to invite users to touch the device, pick it up and hold it and have a tactile experience.

One of the later prototypes featured a pair of large plastic handles, making it look like a particularly inelegant TV dinner tray. When they realized the handle approach clearly wasn't working, Jony's team

started exploring a tapered back that swept away underneath the screen, opening a gap for fingers to slide underneath.

As Jony's team homed in on the iPad design, they were also completing work on the second-generation iPhone. Marketed as the iPhone 3G, to highlight its compatibility with new 3G mobile phone networks, the 2008 follow-up dispensed with the original's aluminium back plate in favour of a hard, polycarbonate plastic. Not surprisingly, then, the two simultaneous development projects shared numerous elements, as the iPad would also get a polycarbonate back, coloured black or white, with a stainless steel bezel to marry the back plate to the screen.

Just as they agreed upon a design, however, production problems forced Jony to change it.

The plastic back of the iPhone 3G looks simple, but was extremely hard to manufacture. Jony and the team wanted to use a similar shell for the iPad, but it proved to be more difficult to manufacture at the larger iPad size, as the larger shell would shrink and warp when it came out of the mould.

Jony's team went back to the drawing board and the designed an aluminium back. They were comfortable with the material; they already had the process and the production lines down. The new aluminium back wasn't as tapered as Jony would have liked. To give the iPad stiffness, the designers had to add a thin sidewall that gave it strenght but made it thicker and bulkier than the planned plastic version.
When they were done, however, Jony's team was excited by the stark minimalism of the device. [22]

[22] ' We wanted a unique form... a very anonymous object, not playing along with the lines of consumer electronics at all, ' said Chris Stringer.

The iPad they produced did not feel like anything else. As Stringer put it ' It felt like a new object. '

iPad Day

On 27 January 2010, Steve Jobs went public with Apple's newest game changer. He announced the iPad at the Yerba Buena Center for the Arts in San Francisco, positioning it as a device that exists between an iPhone and a laptop, a highly portable, handheld slate with a touch-screen interface.

He distinguished it from netbooks, describing the iPad as a device more 'intimate than a laptop', conveying the sense that the iPad was at the intersection of both technology and art.[23]

Financial Data

The iPad went to market in April. In less than a month, Apple sold one million iPads in half the time it took the iPhone to reach that same mark. By June 2011, just over a year after its release, twenty-five million had been sold. By most measures it became the most successful consumer product launch in history. In 2011, shipments of iPads rapidly overtook those of netbooks, sixty-three million versus fewer than tirty million, according to research firm Canalys.

iPad Evolution

Less than a year after the iPads initial launch, in March 2011, Apple surprised the world by announcing a sequel. The new version would be not only a big upgrade in terms of the hardware capability but a wholesale design turnover.

The iPad 2 was thinner and lighter than the original. It gained key new features like front and back cameras, as well as thoughtful touches like a magnetic cover that turned the iPad off and on. The design marked a big

[23] The photo above shows an early customer emerging from the Apple store on Fifth Avenue with Apple Inc's new iPad on April 3, 2010 in New York City. Hundreds lined up in front of the technology company's flagship New York store to be among the first in the world to acquire the device.

advance in manufacturing (with the Unibody Process), which allowed Jony to fashion the deeply bevelled back he originally wanted, but in metal, using Apple's new Unibody Manufacturing Process. ' By reducing what were essentially free surfaces to two, we got rid of the structural wall around the perimeter of the product and eliminated the edge. It's not only more comfortable to hold, but with the breakthrough we made through Unibody Engineering, it's rigid, sturdy and even more precise.' [24]

Furthermore Jony was extremely proud of his group's efforts. 'I can't think of a product that has defined an entire category and then has been completely redesigned in such a short period of time. It is really defined by the display. There are just no distractions.'

In March 2012, Apple followed up with the third-generation iPad, which added a high-density retina display, a faster chip and better cameras. In October of the same years the fourth-generation iPad was launched with a much faster processor and cell connection, as well as a tiny lightning connector to replace the original thirty-pin connector, which was long in the tooth and had become a legacy technology.

In their constant iterations, Apple was beating the 'fast followers' at their own game. Fast followers take a winning product, make it cheaper and get in on the market very quickly. Sometimes the product are cheap knockoffs, but often they are good-enough rivals, as myriad Android phones contest. But by upgrading the iPad quickly and aggressively, and making it significantly better with each version, Apple was staying ahead of their competitors.

The fourth-generation iPad was joined by the iPad mini in 2012, which shrank the screen to just under eight inches, and was enthusiastically snapped up by users. ' The mini gives you all the iPad goodness in a more manageable size, and it's awesome ', wrote David Pogue, an influential tech reviewer with the New York Times. ' You could argue that the iPad Mini is what the iPad always wanted to be. '
In the first quarter of 2013 the iPad mini accounted for about 60 per cent of all iPad sales. [25]

From the initial launch and almost overnight, iPad appeared at cafés and on cross-country flights. Apple executives had predicted several times that the iPad would one day replace the PC, but that switch started happening quicker than anyone expected. In the first year Apple sold nearly fifteen million iPads.

[24] Jonathan Ive in Apple iPad 2 official video 2011, video. http://www.youtube.com/watch?v=fjlvmbJEUmk, March 2011

[25] Gartner Inc., 'Gartner Says Worldwide PC, Tablet and Mobile Phone Shipments to Grow 5.9 Percent in 2013 as Anytime-Anywhere Computing Drives Buyer Behavior'. http://www.gartner.com/newsroom/id/2525515, 24 June 2013

By the fourth quarter of 2011, Apple sold more iPads in just three months than any of its rivals sold PCs.

By 2015, tablets (most of them iPads) will have more market share than the entire traditional PC market, according to estimates by the market research firm Interactive Data Corporation.

The post-PC era, led by Jony and Apple, is upon us.

2011 - iCloud

(iTunes - iPhone 4s - iPad 2 - iPod Touch 5th gen - Macs - Apple Tv 3rd gen)

iCloud has created a link among all devices produced by Apple, broadening Apple ecosystem. It has allowed a high contagion among products, overall with regard to the user interface. iCloud makes possible to bring and use contents everywhere, which before would have been available only on a single physical device. Hence the high index of portability.

iCloud is a cloud storage and cloud computing service launched on October 12, 2011. Today the service has over 500 million users.

The service provides its users with means to store data such as documents, photos, and music on remote servers for download to iOS, Macintosh or Windows devices, to share and send data to other users, and to manage their Apple devices if lost or stolen.

The service also provides the means to wirelessly back up iOS devices directly to iCloud, instead of being reliant on manual backups to a host Mac or Windows computer using iTunes. Service users are also able to share photos, music, and games instantly by linking accounts via AirDrop wireless.

It replaced Apple's MobileMe service, acting as a data syncing center for email, contacts, calendars, bookmarks, notes, reminders (to-do lists), iWork documents.

The cloud-based system allows users to store music, photos, applications, documents, bookmarks, reminders, backups, notes, iBooks, and contacts, and provides a platform for Apple's email servers and calendars. Third-party iOS and OS X app developers are able to implement iCloud functionality in their apps through the iCloud API.

Storage

Several native features of iCloud use each user's iCloud storage allowance, specifically, Backup and restore, and

email, Contacts, and Calendars. On Macs, users can also store most filetypes into iCloud folders of their choosing, rather than only storing them locally on the machine. While Photo Stream uses the iCloud servers, usage does not come out of the user's iCloud storage allowance. This is also true for iTunes Match music content, even for music that is not sold in the iTunes Store and which gets uploaded into iCloud storage, it does not count against the user's allowance. Other apps can optionally integrate app storage out of the user's iCloud storage allowance.

2011 - iPhone 4S
(iPhone 4)

The iPhone 4s is a gradual step over the iPhone 4 improving the internals, but keeping the look and feel. At the same time, though, it brings a reworked iOS 5 and introduces Siri, a personal voice assistant allowing you to vocally communicate with the iPhone. It comes with a 3.5" screen with a resolution of 640 x 960 pixels, but on the inside there's a twice more powerful dual-core A5 processor. It also improves connectivity a notch, bringing 14.4Mbps HSPA download speeds. The back is where an 8-megapixel camera resides and it's capable of recording 1080p videos.

The iPhone 4S is almost identical in appearance to the iPhone 4. The only visible difference comes courtesy that new antennae design. On both phones the antennae is incorporated into the stainless band that wraps round the edge, and famously on the iPhone 4 this lead to problems when the phone was held such that your hand or fingers covered the thin strips of black plastic that seperated the aerial into segments.
On the iPhone 4S these black strips have doubled in number, indicating the phone's use of two antennae. Thanks to having to incorporate these extra black strips, the mute switch on the left edge has had to move closer to the volume buttons.

This slight change in button placement could actually be one of this phone's first major problems as many iPhone 4 cases that otherwise would've fit may not do so now.

The front and back are formed of two slabs of toughened glass that are incredibly resistant to everyday scratches though prone to shattering if dropped.

The back is home to the all important new camera (the increased lens size of which is just about discernible) with its accompanying LED.

2012 - Apple TV 3rd gen
(Apple Tv 2nd gen)

NETFLIX

In the March 7, 2012 presentation that mainly dealt with the third generation iPad, Apple CEO Tim Cook announced a third version of the Apple TV.
The new Apple TV is externally identical to the second generation model and includes a single-core A5 processor. It also supports 1080p content from iTunes and Netflix.

On January 28, 2013, Apple released a third generation "Rev A" which included component changes.
On March 9, 2015, Apple reduced the price of the third-generation (Rev A) Apple TV to $69.

Both third generation Apple TV models make it easy to rent or purchase movies and TV shows from Apple as well as stream or mirror movies, shows, photos and other content from an iPod, iPhone or iPad as well as from a Mac or PC. It has built-in support for iCloud, Netflix, YouTube and Flickr along with other services.

This model runs a variant of the iOS that powers the iPhone, iPod touch and iPad models, although it does not formally run the iOS and it cannot run iOS applications either.

2012 - Apple Mac Mini

(Mac Mini 2005)

The Apple Mac mini "Core i5" 2.5 (Late 2012/Aluminum Unibody) features a 22-nm "Ivy Bridge" 2.5 GHz Intel "Core i5" processor.

Connectivity includes a Firewire "800" port, four USB 3.0 ports, HDMI, Thunderbolt, combined "audio line in (digital/analog)" and combined "audio line out/headphone (digital/analog)" minijacks.

Compared to its predecessor, this model looks identical, but it has a faster internal architecture with a faster processor, faster graphics, faster RAM, and USB 3.0 ports.

All Mac mini systems are configured by default without a display, keyboard, or mouse, but numerous Apple and third-party options are available.

2012 - iPhone 5

(MacBook Air Unibody - iPhone EDGE - iPhone 4s)

Apple announced another iPhone event for September 12, 2012. There, Apple senior vice president of worldwide marketing introduced "the biggest thing to happen to the iPhone since the original iPhone. Big as in tall. Big as in light. Big as in LTE. Big as in the iPhone 5."

iPhone 5, codenamed N41/N42, was the fourth major redesign and the second major improvement to the iPhone's display since the original.

It was the fist time, however, Apple changed aspect ratios. All previous iPhones had been 3:2. The iPhone 5 was a more cinematic 16:9. It meant movies and TV could be shown with less or no letterboxing, and apps could take advantage of an extra row of content. That's because Apple had simply added pixels to take the iPhone from 3.5-inches to 4-inches.

Apple also switched to in-cell technology, which let them combine the touch sensor and LCD into one layer. If the pixels of the iPhone 4 and iPhone 4s looked like they were painted beneath glass, the pixels on the iPhone 5 looked like they were painted inside the glass. It reduced reflections and made everything look better. There were some issues with rapid, changing, diagonal swiping, but overall Apple had succeeded in once again making the best, if not the biggest, display in the business.

Although the screen got bigger, paradoxically the iPhone 5 itself got smaller (12% smaller by volume than its predecessor). It required a manufacturing process with precision and at scale never seen before. According to Apple senior vice president of design, Jony Ive, they now measured in microns. [26]

Though the overall rounded-rectangle shape of the iPhone 5 stayed the same, Apple rebuilt the casing from the atoms on up. Instead of a glass back and stainless steel band, they went back to the aluminium of the original iPhone.

This time, however, they made it a unibody that covered the back and sides and included diamond polished chamfered edges. Ceramic/pigmented glass was still used on the top and bottom for RF transparency, however, resulting in a two-tone effect.

Apple offered both white and silver (Stormtrooper) and black and slate (Vader). The silver was clear-coated aluminium. The slate was anodized. Dark colors, especially black, are incredibly hard to anodize and that did cause some issues for Apple when it came to scratching and chipping.

The iPhone 5 also debuted Apple's first truly custom processor. Previous Apple A-series processors had been based on existing ARM reference platforms like Cortex A9. For the Apple A6, Apple licensed the ARM v7s instruction set and made their own design that was codenamed Swift. It was roughly twice as fast. There was no new storage option, however, so 64GB remained the max. The battery did creep up to 1440mAh and that, along with new efficiencies, increased useful battery life.

[26] A unit of length equal to one thousandth (10^-3) of a millimeter or one millionth (10^-6) of a meter.

The Apple A6 image signal processor (ISP) added spatial noise reduction as well as increased speed. Because of the 25% thinner body, Apple wasn't able to include a better physical camera but they somehow managed to squeeze a camera into the iPhone 5 that was just as good as the iPhone 4S.
Re-branded under the old "iSight" name, Apple did add a new, dynamic low-light mode which they claimed was up to 2 f-stops better. Apple also claimed the 5-element lens has been aligned with even greater precision for even greater sharpness. Also, the surface of the iSight was switched to sapphire crystal to make it more scratch resistant.

Apple also added a 3rd mic for better noise cancellation and beamforming. Thanks to FaceTime, Siri, and other, newer technologies, we didn't just talk into our phones any more. We talked at them and from all around them.

The iPhone 5 was also a turning point in another major area. After 10 years of 30-pin Dock connector, Apple swapped it out for the smaller, more flexible, more advanced Lightning connector, 80% smaller. It caused a lot of pain for a lot of people who'd accumulated a lot of Dock connector-based accessories over the years. It was a necessary and good change, however, and over time the conversion pain diminished.

The iconic earbuds were also updated for the iPhone 5, becoming EarPods. The shape of the EarPods was a significant divergence, instead of being uniformly round, the EarPods were asymmetrically shaped and, according to Apple, ergonomically designed to better fit a wider range of ears.
EarPods also featured a new, multi-port design. The main EarPod speaker directed sound into your ear. The port on the back was tuned to mid-range frequencies and intended to improve consistency of experience. Ports in the stem were meant to improve bass. Air channels reduced pressure on the speaker so it could concentrate on providing greater low-frequency sound. They still weren't high-end and weren't meant to be, but for in-the-box headsets, they were an improvement.

The iPhone 5 launched in the US, Australia, Canada, France, Germany, Hong Kong, Japan, Singapore and the UK on September 21, 2012. By the end of the year it was available in 100 countries on 240 carriers. Apple also launched iOS 6 with it. They sold 5 million the first weekend. Tim Cook, via Apple, "Demand for iPhone 5 has been incredible and we

are working hard to get an iPhone 5 into the hands of every customer who wants one as quickly as possible. While we have sold out of our initial supply, stores continue to receive iPhone 5 shipments regularly and customers can continue to order online and receive an estimated delivery date.

2012 - iPad Mini
(iPad 4 - iPhone 5)

Apple senior vice-president of industrial design and human interface, Jonathan Ive, said the iPad mini isn't merely a reduction of the existing, full-sized iPad, but a concentration. The overall difference in physical size works out to 7.87x5.3x0.28 inches for the iPad mini vs. 9.5x7.31x0.37 inches for the iPad 4. The difference in weight is 0.68 vs. 1.44 lbs. That makes the iPad mini almost a quarter thinner and half as light as the iPad 4.
The iPad mini is not as light as some slightly smaller but thicker competing tablets, but its aluminium unibody gives it a substance beyond what's been attained by squeaky plastic substitutes.
Compared to the regular iPad, however, the difference in weight is profound.
Where the iPhone and iPod can be used one handed, and the iPad requires two hands, the iPad mini is your hand-and-halfer.

The iPhone is small enough that it can generally be used one handed, and small enough that even when a finger is displaced, it's a short, incredibly easy-to-judge distance. The odds of missing even a smaller button are low.

The full-sized iPad is big enough that it requires two hands to use, and big enough that when a finger is displaced, it's for a longer, not always as easy-to-judge distance. The odds of hitting a bigger tap target (i.e. button) are higher.

The 9.7-inch iPad has considerably more screen space than the 3.5-inch iPhone, and Apple wisely leveraged it with bigger interface elements to increase usability. That's especially important for children, seniors, and people who have found pre-iOS computing devices intimidating or inaccessible, and might be in a higher stress state to begin with when faced with interface elements.

Unlike the last 3 generations of iPad, the iPad mini benefits from every bit of advancement Apple's made in their manufacturing process. While the front looks the same as the larger iPad, indeed the same as every iOS device, the back and sides now sport the ultra-modern iPod touch 5 look.

The same anodized aluminium, flat backed, rounded edged, metal buttoned, mono-crystalline diamond-cut chamfered design that wraps the new iPod touch wraps the new iPad mini. Apple calls it their most advanced unibody design yet, and it looks it. Down to the micron.

The iPad mini also comes in the same black-and-slate and white-and-silver color options as the iPhone 5 and iPod touch 5 (though the iPod touch now comes in many more colors as well).

The iPad mini has a 1024x768 LCD screen with LED backlighting for excellent color and clarity and, thanks to IPS (in-plane switching) technology, excellent viewing angle as well. Unlike the iPad 4, however, instead of a 9.7-inch screen, the iPad mini has a 7.9-inch screen.

When Apple introduced the iPad they didn't simply scale up the existing iPhone iOS interface. Instead, they created a new screen size, screen resolution and aspect ratio, and initially used a lower pixel density.
Because big tablets are generally held further away than small phones, the difference in pixel density wasn't readily apparent to the naked eye. Interface elements are slightly bigger on the full-sized iPad than on the iPhone and there's an important reason for this, accuracy decreases over distance.

2013 - iPhone 5s
(iPhone 5)

Apple's event on September 10, 2013 was unique in their history. They introduced not one but two new phones on stage that day. The first was a re-imagining of the previous year's model in a new, more

colorful form. It was the past made present. The second was all about the future. It was, as Phil Schiller called it, the most forward thinking iPhone ever. It was the iPhone 5s.
iPhone 5s is the most forward-thinking smartphone in the world, delivering desktop class architecture in the palm of your hand. iPhone 5s sets a new standard for smartphones, packed into its beautiful and refined design are breakthrough features that really matter to people, like Touch ID, a simple and secure way to unlock your phone with just a touch of your finger.

The iPhone 5s, codenamed N51 and model number iPhone6,1, kept the same design as the previous year's iPhone 5, something that had become a hallmark of Apple's S-class phones. (The shift from uppercase S to lowercase s in the branding was likely a visual concession, 5S has a great chance of being confused for 55 than 5s does.) That meant the iPhone 5s kept the same 4-inch, 1136x640 pixel, 326ppi, 16:9 aspect ratio display, and the same in-cell technology that made the pixels look like they were fused right into the screen.

The colour

The same aluminium unibody was kept as well, with its ceramic glass inlays on the back for RF transparency and its diamond chamfered edges.
The original iPhone had been available only in aluminium and black. The iPhone 3G and iPhone 3GS had black front plates but offered both black and white back plate options. The iPhone 4 and iPhone 4s had come, front and back, in black or white. The iPhone 5 was two tone, but those tones were still black and slate gray, and white and silver. The iPhone 5s added white and gold.

While gold is the easiest colors to anodize, black remained the hardest. After dealing with scratches and chips on the black and slate gray iPhone 5, Apple switched to black and space gray on the iPhone 5s. It wasn't a big change in terms of shade, but it proved to be a giant leap when it came to resiliency.

Touch ID

Security is always at war with convenience. Apple's numbers showed only half of their hundreds of millions of customers used a 4-digit passcode on their iPhones. Touch ID would allow people to authenticate and their iPhones, and authorize purchases on the iTunes Store, App Store, and iBooks Store, simply by placing their finger on the Home button. Less secure than a long, alphanumeric password, but much more likely to be used than even a weak passcode, in the endless war between security and

convenience, it was a good compromise.

There was some initial concern as to how reliable Touch ID would be. Fingerprint sensors on competing devices had been considerably less than stellar to date. There was also a lot of fear, uncertainty, and doubt (FUD) spread right after launch. There were videos of people making fake fingerprints to spoof the system. There was also a problem with the method intended to improve reliability with each and every read of the fingerprint, sometimes it took a wrong turn. The FUD failed, the spoofs were understood in context, and Apple ultimately released updates to iOS 7 to fix the reliability.

Camera

Beyond the chipset, the iPhone 5s' iSight camera is still a Sony IMX145 and Exmor-RS CMOS sensor but size has gone up from 1.4 to 1.5 microns, and aperture from f/2.4 to f/2/2. This combined for a 33% increase in light sensitivity. Apple also added a bicolor TrueTone flash that had both yellow and white elements to better match existing color temperatures.

Competitors

HTC continued to release good, if strangely branded, phones like the HTC One M8. Though consistently reviewed better than Samsung their sales haven't come close to catching up. Google sold Motorola to Lenovo, though there's every indication interesting phones like the Moto X will continue. Google also announced Android L, a preview of their next generation mobile operating system. Just as Apple has been moving from their foundation of excellent interactivity into new levels of functionality, so Google has been moving from excellent functionality into new levels of interactivity.

Nokia, it's value crushed by former Microsoft executive Stephan Elop, ended up being bought by outgoing Microsoft CEO Steve Ballmer, ostensibly to prevent Windows Phone's largest manufacturer from shifting to Android. The deal closed and Microsoft went on to ship Windows Phone 8.1 and Cortana, their Siri-like virtual assistant. They continue to have some level of traction, especially with lower cost devices in emerging markets, but like everyone else not-Apple and not-Samsung, haven't seen much increase in profitability in the rest of the market. New CEO, Satya Nadella comes from a cloud and services background, and Microsoft has been increasingly good at supporting the iPhone and iPad, so perhaps the future for them lies cross-platform?

BlackBerry, with Thorten Heins gone and former Sybase CEO, John Chen now in his place, shifted focus back towards the enterprise and doubled down on keyboards, announcing the upcoming

BlackBerry Passport, a phone no one would ever mistake for just another post-iPhone slab. What and how much they can do with it, however, remains to be seen.

2013 - iPhone 5C

(iPhone 5s - iMac ‘98 - MacBook - iPod Touch 5th gen)

It was that on September 10, 2013, when Tim Cook took the stage, he announced that unlike almost every year previously, Apple wasn't going to lower the price of the previous year's black- and white-cased iPhone 5. That year the business had grown so large, Apple was going to replace with something new, something fun, something colorful. With the iPhone 5c. iPhone 5c, codenamed N48 and model number iPhone5,3, marked the first time Apple didn't simple drop the previous year's flagship down to mid-tier pricing. Instead, they repackaged it as something new. It had the same 1136x640, 16:9 in-cell display, but it replaced the aluminium casing with polycarbonate. The change did cost Apple slightly when it came to size, adding millimeters around the edges and on the back, but it let them replace the harder-to-manufacture and easier to damage aluminium of the iPhone 5 with the more rugged, hard-coated polycarbonate of the iPhone 5c. Also, as Apple had previously done with the iPod lineup, including the iPod touch, having a dedicated device at a lower-price point let them use color as a differentiator.

Set against the traditional black/slate and white/silver of the premium line, the iPhone 5c popped in plastic tinted bright green, blue, yellow, pink, and white.

Apple had used plastic casings before for the iPhone 3G and iPhone 3GS. For the iPhone 5c, however, they put it around a metal frame so it felt rock solid. They called it "unapologetically" plastic and it was.

Internally the iPhone 5c used the same Apple A6 system-on-a-chip (SoC) as the previous year's iPhone 5. In fact, almost all the internals were the same.

A few things did change. While the 16GB and 32GB solid state storage options remained, there was no 64GB option, likely a concession to its mid-tier status.

The LTE 4G radio was also improved, gaining support for 13 bands, albeit over 5 different models.

The price, however, reflected the new position and reduced storage options: $99 for 16GB, $199 for 32GB on contract.
Apple had been toying with the idea of a new-old iPhone for years. It sometimes leaked as an iPhone mini or as a budget iPhone for emerging markets. It was never intended to be either of those things.
The less expensive price point was a byproduct for the mid-tier positioning, not the other way around. For Apple to really bring attention to that spot on the product line, to make the iPhone even more mainstream, they needed a product worthy of that mainstream attention.

The iPhone 5c debuted alongside iOS 7. That Apple's first new mid-tier hardware and first major software redesign coincided allowed them to carefully plan so that each accented the other, so that they looked like they were designed together.

iOS 7 even made the older elements of the hardware more useful. It brought, for example, live camera filters, video zoom, and FaceTime audio calls. But the effect was greater than the sum of its features.
There was always some overlap of shapes, of rounded rectangles and circles, but Apple made sure to coordinate the colours of the iPhone 5c casings with the palette of the iOS 7 icons, text, and tints.

Alongside the iPhone 5c Apple also introduced a line of cases. They came in the same shades of green, blue, yellow, pink, and white, and also in black. Unlike the hard finish of the iPhone 5c, the cases were soft-touch so you could not only change up the look, you could change up the feeling. Apple heavily promoted the options with graphics and web tools that showcased the wide range of mix-and-match options.

Apple claimed they, like iOS 7, had been designed with the iPhone 5c in mind, including the grid of circular cutouts along the bottom that let the phone's color shine through, creating an almost half-tone effect. Unfortunately, it also let a phew of the characters

printed on the back of the iPhone 5c shine through, namely "non", which didn't bother some but others found amusing or off-putting.

The iPhone 5c launched in the U.S, Australia, Canada, China, France, Germany, Hong Kong, Japan, Puerto Rico, Singapore and the U.K. on September 20, 2013. It's hard to say how many were sold that first weekend because the iPhone 5s was sold along with it and Apple does not break down numbers per model.

Apple did say they sold 9 million iPhones combined that weekend, and some analysts have estimated the iPhone 5c accounted for about 2.25 million of those.

Rumors of the iPhone 5c being a cheap or budget or emerging markets iPhone may have led to the wrong expectations, at least for those who hadn't followed Apple's business for length of time. Likewise, rumors of manufacturing cuts may have caused some confusion, as might have the product itself.

It wasn't packaged like previous iPhones, in a box and meant to sit in back-of-house. It was packaged like an iPod in a clear plastic case that let its color shine through to entice anyone walking by. The iPhone 5c was bought steadily, day by day, week by week, month by month, pushing it up top-sellers charts.

The iPhone 5c wasn't the fastest or most powerful or most forward thinking new iPhone on the market. But for many people, for mainstream people, for first time smartphone or any phone buyers, for people who were slightly more price sensitive but who also had a certain vibe and vibrance to their tastes, for those people the iPhone 5c might have been the best.

2013 - iPad Mini 2 - Retina Display

(iPod 4th gen - iPhone 4 - iPad 3rd gen)

Retina display is the introduced feature of the iPad mini 2.

2013 - iPad Air

(Macbook Air - iPad Mini - iPad 4)

iPad Air, the name given the iPad 5, brings with it a new design that looks a lot slimmer, and feels a lot lighter, just like the iPad mini.

iPad Air brings an Apple A7 processor, 64-bits of power, and an Apple M7 motion coprocessor as well, improved LTE support and a bumped up FaceTime and iSight camera.

The physical transformation from iPad to iPad Air is the single most important update to Apple's full-sized tablet, and alongside the iPad 2 redesign, one of the most important updates in the brief history of the device.

With the iPad Air, Apple brings Apple's their new tablet design language, begun with the 4-inch iPod touch and 7.9-inch iPad mini in 2012, to the 9.7-inch form factor. What makes it so much more impressive, is what Apple has managed to cram into this new 9.4 inches (240 mm) x 6.6 inches (169.5 mm) x 0.29 inch (7.5 mm), 1 pound (469 g) glass and aluminium chassis.

2014 - iPhone 6 - iPhone 6 Plus

(iPad Mini Retina Display - iPad Air - iPhone 5s)

Apple is pitching the iPhone 6 as not only bigger but better, more advanced display technology, second generation 64-bit processor and motion coprocessor, improved cameras, faster cellular and Wi-Fi networking, and a new transaction system called Apple Pay.

The 4.7-inch iPhone 6 launched on September 19th, 2014 alongside the iPhone 6 Plus, which features a larger 5.5" display.

The iPhone 6 features a display with a resolution of 1334 x 750. The pixel count is 326 ppi, which is the same as the iPhone 5s. However, the contrast ratio now sits at 1400:1, which is a drastic improvement over the iPhone 5s' ratio of 800:1. The display also packs duel-domain pixels, which allows for wider and better viewing angles.

Apple has not just increased the size of the display, however, they have increased the quality.

The iPhone 6 implements the full sRGB color gamut. That means all colors, including the reds and purples that are sometimes suppressed on lesser displays, will look deep and vibrant. It's great for everyone, but particularly great for photographers, artists, designers, and other creative professionals who want to move graphics from desktop to mobile and maintain color accuracy. It means we can play around with lower contrasts and subtle tonal changes and still count on the iPhone to properly showcase our work.

Both the iPhone 6 and iPhone 6 Plus are equipped with Apple A8 64-bit chipsets which also tout a new M8 motion coprocessor for even better performance than its predecessors. While Apple hasn't made any mention of RAM, we're going to assume that it sports the same 1GB of RAM as its predecessor until we hear any different.

The iPhone 6 features support for up to 20 LTE bands worldwide, Wi-Fi calling, LTE Advanced, VoLTE, and more.

With faster chips, faster networking, better cameras, and an unprecedented choice between a denser or bigger display, the iPhone 6 is the best, most accessible, most capable iPhone Apple has ever made. And, for most people, most of the time, remains the best phone period.

The iPhone 6, and iPhone 6 Plus, have been shipped in the most minimalist boxes ever produced by Apple. They're white with nary a rendering of the phone in sight.

iSight camera

The rear facing iSight camera in the iPhone 6 has an all-new sensor that should handle everyday photography better than ever. HD video recording and slow-mo video have also gotten boosted to 60 fps and 240 fps, respectively. The front-facing FaceTime camera appears to remain largely unchanged. The iPhone 6's rear-facing iSight camera still sports a five-element lens with a sapphire crystal lens cover, still has a hybrid IR-filter and backside illuminated sensor (BSI), and it’s still the same 8 megapixels it’s been since the iPhone 4s.

The problem with megapixels is that they represent quantity, not quality. One of the ways Apple is going beyond the megapixel fight is with focus pixels. Typically found in higher-end cameras, focus pixels allow for something called phase-detection autofocus: Basically, there are dedicated pairs of pixels in the image sensor that read the light and instruct the camera's optics on how to adjust to achieve focus. This results in much faster focusing than the older, contrast-based system, which moved the lens back and forth until it could lock on.

In burst mode, face detection is also better at recognizing open eyes and smiles, so when you hold your finger down on the shutter, the ISP will filter out the bad shots and present you with better options than were previously possible.

Apple also offers a timer mode in iOS 8, as well as full on manual camera controls for third-party App Store apps, so experts and enthusiasts can adjust focus, exposure, and white balance to their heart's content. The company has also backed exposure bias right into the camera interface. Tap to focus and you'll see a sun icon; drag it up or down, and you bias the exposure brighter or darker.

There's a new time-lapse mode in iOS 8 that takes photos at dynamic intervals and stitches them together in a video. It's what you see in movies and TV when clouds stream rapidly by, the sun quickly sets and rises again, and a house gets built in moment by people moving at incredible speed.

There’s also a new "cinematic" image stabilization that uses the ISP in the Apple A8 to analyze what you shoot to isolate and remove unwanted motion from your video. So, for example, if you're on roller skates and you're filming someone else on roller skates, the image stabilization will try and remove any bumps, jostles, shakes, or other disturbances you experience while shooting. That way your subject does not look like they're bumping, jostling, or shaking; they just look like they're skating smoothly.

Apple Pay

The iPhone 6 and iPhone 6 Plus both feature built-in NFC (Near-Field Communications) functionality that will work seamlessly with Apple's new payment system, Apple Pay. NFC is a technology that enables, among other things, tap-to pay functionality. Apple Pay combines NFC and Touch ID in order to allow you to make payments with your iPhone across thousands of merchants in the United States and in many countries around the world.

iPhone 6 Plus
(iPad Mini Retina Display - iPad Air - iPhone 5s)

The iPhone 6 Plus looks like a bigger, bolder iPhone 6. Same iconic shape and Home button, same newer, thinner casing and rounded edges. Same new sleep/wake button placement along the side, same raised camera ring, microphone styling, and backplate with radio-transparent lines cutting across the aluminium. All of it, the same. Except for the size.

It's 6.22 inches (158.1mm) high, 3.06 inches (77.8mm) wide, 0.28 inches (7.1mm) thick, and weighs 6.07 ounces (172 grams).

That's 0.78 inches (20mm) taller, 0.24 inches (10.8mm) wider, 0.01 inches (0.2mm) thicker, and 1.52-ounces (43 grams) heavier than the iPhone 6, but 1.65-inches (41.9mm) shorter, 2.24 inches (56.9mm) narrower, 0.01 inches (0.3mm) thinner, and 5.93 ounces (169 grams) lighter than the Retina iPad mini + Cellular.

Because the iPhone 6 Plus is bigger than any iPhone before, and people unfamiliar with bigger phones have treated them like small phones, in a way an iPad mini, for example, would probably never be treated, there have been some cases of accidental bends. It's extremely unfortunate, but it's something increased awareness, and perhaps future revisions by Apple, can help address.

The iPhone 6 Plus' size can also make it difficult to use one handed, and difficult to fit into a pocket. Apple used to claim that one-handed ease of use required your thumb be able to reach almost any area of the display, including the button at the opposite corner. The roundness, the lightness, the moving of the sleep/wake button from the top to the right, all help, but now so does the software.

Because the Home button's Touch ID sensor includes a capacitive ring to detect finger contact, it can also detect taps, just like the capacitive multitouch display.

Double-tap the Home button and "reachability" mode activates, sliding the entire interface halfway down the screen, and bringing any icons, buttons, and other interface elements from the top to much more accessible positions.

2014 - iPad Mini 3

(iPhone 6 - iPhone 6 Plus - iPad Mini 2 - iPad Air)

The iPad mini 3 looks almost identical to the iPad mini 2, which looked almost identical to the original iPad mini.

The main differences come in the form of the Touch ID sensor, which replaces the old home button with a smart one that can identify who we are, and an optional gold finish.

The iPad mini 3 is the same 7.87 inches (200 mm) tall, 5.3 inches (134.7 mm) wide, and 0.29 inches (7.5 mm) deep as its predecessor, and weighs the same 0.73 pounds (331 g), 0.75 pounds (341 g) for the cellular version, as the iPad mini 2.

It sports the same 3.5mm headset jack and dual microphones at the top of the device, and the same top-mounted sleep/wake button, something that seems less natural now that the iPhone 6 and iPhone 6 Plus have moved it to the side. Unlike the iPad Air 2, the iPad mini 3 retains the mute/lock rotation switch on the side; immediately below that are the volume up and down buttons.

The touch ID is Apple's biometric fingerprint identity sensor. It debuted with the iPhone 5s, replacing the traditional Home button. And now it's come to the iPad mini 3.

To make Touch ID secure, Apple implements a sophisticated, and rather interesting, system. When the capacitive ring around the sensor detects the presence of a finger, a high-resolution lens reads it. Once that fingerprint is read, it's converted to a mathematical hash and the original image is destroyed. That hash is then sent to the iPad mini's secure enclave, found within the Apple A7 chipset, and compared to any of the fingerprints registered there. If a match is found, the secure enclave releases a “yes” token. If no match is found, it releases a “no” token.

That system lets Touch ID do quite a few things: authenticate and unlock the iPad; open password manager or banking app; authorize payments on the iTunes Store, App Store, iBooks Store; or, newly-added pay for goods online via Apple Pay.

It's far more secure than having no passcode, and far more convenient than a strong, unique password. That means it's far more likely people will actually use it. Better still, Touch ID pairs its fingerprint system with a strong password option; this lets you add a good password to your device without having the pain of entering it every time, providing for even better security.

2014 - iPad Air 2
(iPad Air 1 - iPad 3 Retina - iPhone 6 Plus)

The iPad Air 2 display, at 2048-by-1536 pixels and 264 pixels-per-inch, it was Apple's third, and best, revision of the iPad Retina panel. It also had an excellent color gamut, including deep, rich reds and purples.
Unlike the iPhone, which switched to laminated displays in 2010, the iPad has always had three separate layers for its screen, multitouch sensors, and LCD panel. That created air gaps between the pixels and the glass, and light reflecting off those gaps created screen glare.
With the iPad Air 2, those three layers have been fused into a single layer. That eliminates gaps as a source for potential glare. The company has also added an all-new, all-custom antiglare coating. The result is something far more usable in direct light, be it incandescent or florescent, at home, work, or school, or in outside sunlight.

Apple pegs the reduction in glare at 56 percent. The real difference is that it becomes usable in places where previous generation iPads just wouldn't be as functional, like when reading outdoors.

It may not be as technologically advanced as the new Retina HD panel found in the iPhone 6 or iPhone 6 Plus, but at 9.7 inches, it's incredibly impressive.

The pixels no longer seem to be floating somewhere beneath the glass. Now they seem painted inside it. It's like opening a window and seeing the world, the real world.

2015 - MacBook

(iPad Air 2 - Macbook 2010 - iPhone 6 - iPhone 6 Plus)

Every year Apple likes to redefine what it means to be a laptop. Now MacBook is defined as an iPad with a keyboard. The concept of portability and design is increasingly emphasized, also by the fact that the MacBook is produced only with a 12-inch Retina Display.

As we have proven the company has done it with plastics and metals, and even with envelopes. Drives have come and gone and so have ports.

With this latest MacBook, the first to bear just that simple name since 2011, even the constants of screen, keyboard, and trackpad have changed. They've gone Retina, Butterfly, and Force Touch respectively. They, each of them, have once again become the state of the art.

More remarkably, the thinness and lightness does not come at the price of solidity.

The new MacBook is still a unibody, like the last major MacBook redesign, and still comes with all the structural benefits of being formed from a single piece of aluminium. It is, however, a new and improved unibody.

The differences are easily observed. It's metal now, not plastic, all the way up. That makes the new MacBook feel even more like a singular object.

The MacBook is also anodized now, so just like iPhones and iPads you can choose between space gray, silver, and gold finishes.

The screen bezel has also been minimized and blacked out, like the MacBook Pro and unlike the MacBook Air. There's also a speaker grid now between the screen and the keyboard. Hopefully, though, once Apple gets done with Retina for ours eyes, they'll switch to working on something just as impressive for our ears.

The word "MacBook" appears at the bottom. Something Apple has stopped doing with the more recent MacBook Pro iterations.
Gone also is the glowing Apple logo on the back. The sight of it everywhere from coffee shops to the State of the Union to Microsoft's media events was impossible to miss.
The new version is polished, like the iPhone 6 and iPad Air 2.

Design

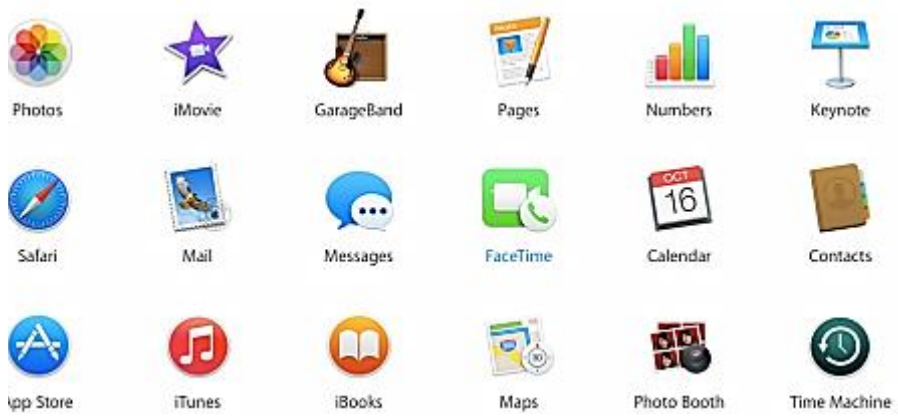
Apple has designed the new MacBook to be not only thinner and lighter, but more functional and intuitive than ever before. To do that, Apple started from scratch, reinventing each essential element as part of a singular, deceptively simple design.

2015 - iMac with Retina 5K Display
(iMac 2009 - MacBook 2015)

The 27‑inch iMac with Retina 5K display has four times as many pixels as the standard 27‑inch iMac display.
Apple has developed a display with the performance to light up 14.7 million pixels, reducing energy consumption while maintaining our high standard for brightness, and advancing image quality for the most striking contrast ever. And Apple did it all without compromising the incredibly thin design, just 5 mm at its edge.
iMac 5K is the most powerful iMac yet with a quad-core Intel Core processor available at up to 4.0GHz, the latest AMD graphics, an advanced Fusion Drive, and Thunderbolt 2.

OS X is what makes a Mac a Mac. Not only is it designed to be intuitive and easy to use, but it's also engineered to take full advantage of the Retina 5K display.

Built-in Apps



Every new Mac comes with Photos, iMovie, GarageBand, Pages, Numbers, and Keynote. It comes with apps for creativity and apps for productivity. It also comes with a collection of great apps for surfing the web, sending mail and messages, and organizing the calendar. It even comes with an app for finding new apps.

2015 - Apple Watch

(MacBook - iPod Nano 6th gen - iPhone 6 - iPhone 6 Plus)

The Apple Watch is Apple's newest most personal and portable computer. It comes in two sizes, 38mm and 42mm, and three collections: the aluminium Apple Watch Sport, the stainless steel Apple Watch, and the gold Apple Watch Edition.

All three models of the Apple Watch have been available for pre-order and in-store preview from April 10th, 2015.

All three versions of the Apple Watch have gone on sale on April 24th, 2015 in the US, Australia, Canada, China, France, Germany, Hong Kong, Japan, and the UK.

The Apple Watch represents a step into the luxury goods field. In fact Apple Watch Sport starts at $349 while the Apple Watch Edition goes to $17K.

Codenamed gizmo, the Apple Watch project began in 2011, championed by senior vice president of design, Jony Ive and his friend, and now official collaborator, Marc Newson.

The device runs Watch OS, a variation iOS headed by vice president Kevin Lynch.

Instead of the traditional springboard home screen found on iPhone or iPad, the Apple Watch runs a carousel of round icons that change in scale and position.

Instead of gestures for navigation, it uses a digital crown to handle scrolling and zooming, and a force press to bring up secondary actions. There's also a button beneath the crown that launches a friend interface or can be double-clicked to go into Apple Pay.

Developers can make apps for the Apple Watch using WatchKit. Currently WatchKit supports looks (notifications), glances (widgets),

and WatchKit apps (remote views), with native apps.

Apple has also made several other unique apps for the Apple Watch, including Fitness, Activity, and Workout for health and fitness, a remote viewfinder for the iPhone's camera, and more.

To make the best use of its size and location on your wrist, Apple Watch has all-new interactions and technologies. They let you do familiar things more quickly and conveniently. As well as some things that simply weren't possible before. So using it is a whole new experience, which is more personal than ever.

Technology

Innovation is studied in every interaction. Apple has invented all-new ways to select, navigate, and input that are ideally suited to a smaller device worn on the wrist.

Digital Crown

On mechanical watches, the crown has historically been used to set the time and date and to wind the mainspring. Apple has reimagined it as a versatile tool that answers the fundamental challenge of how to magnify content on a small display. Pinching to zoom, as on iPhone, is impractical. But turning the Digital Crown allows to navigate nimbly and precisely, without obstructing the view. It is possible to zoom in and out of photos, quickly scroll through lists, input data, or press it like a button to return to your watch face.

The Digital Crown is an integral part of the Apple Watch experience.

Timekeeping

High-quality watches have long been defined by their ability to keep unfailingly accurate time, and Apple Watch is no exception. In conjunction with the iPhone, it keeps time within 50 milliseconds of the definitive global time standard. It even lets customize your watch face to present time in a more meaningful, personal context that's relevant to your life and schedule.

Complications

Many watches include a few specialized functions, known in watchmaking as complications, that go beyond telling the time. But Apple Watch comes with a full range that can be added to most faces. Some complications are traditional, such as moon phases or sunrises and sunsets. Some are more modern, like stock quotes, weather reports, your next calendar event, and a daily activity tracker. And you can tap on certain complications to get more information from their corresponding apps.

Working with iPhone, Apple Watch continually checks against the definitive global time standard with the same precision found in GPS satellites. It's so precise, the second hand of every Apple Watch across the world is in sync. When daylight saving time begins, Apple Watch simply changes to the new time. And if you move from one time zone to another, Apple Watch automatically adjusts. You never once have to set the time yourself.

The Sport collection (Watch Sport) cases are made from lightweight anodized aluminium in silver and space grey. The display is protected by strengthened Ion-X glass. And the matching fluoroelastomer band comes in five different colours.

The Apple Watch collection features highly polished stainless steel and space black stainless steel cases. The display is protected by sapphire crystal. And there's a choice of three different leather bands, a link bracelet, a Milanese loop, and a band made from high-performance fluoroelastomer.

The Edition collection (Watch Edition) features eight uniquely elegant expressions of Apple Watch. Each has a watchcase crafted from 18-karat gold that our metallurgists have developed to be up to twice as hard as standard gold. The display is protected by polished sapphire crystal. And an exquisitely designed band provides a striking complement.

Chapter 2

The elements of contagion along the Apple products' *family tree*

2.1. User interface

After this archival analysis we can identify some elements on which Apple has focused more.
Each characteristic of these elements has been held, changed or selected out, depending on the different strategy adopted over the years.

Surely one of the most peculiar characteristics to take in consideration is the user interface. It is the most relevant feature in all Apple products because it internalizes the main concept on which Apple is based: the simplicity.

One of the major innovations of the original Macintosh was that it showed on the screen the font chosen for the text. Until then, what was drawn on computer screens was just like on a typewriter. It was on the insistence of Steve Jobs that the first Mac had the ability to display different fonts. As he explained in his famous speech at Stanford University, this effort was due to a fleeting period in college when he was bored and decided to take a course in calligraphy.

Since Apple II was born, the user interface has been conceived as something of innovative but overall user-friendly. The computer was intended to satisfy ordinary people needs.
The user-friendly design and graphical display made Apple a leader in the first decade of personal computing.
Innovations like the mouse were introduced to make almost everything possible and simpler. The Lisa is the first computer to bring a mouse. Now it was just needed to point-and-click at tiny pictures on the screen with a small rolling device to give inputs to the computer.
With the Apple IIc users can interact easier with the computer. It did not required technical know-how or experience and therefore it was attractive to first-time users.
The introduction of a colour graphical user interface comes with the Apple IIgs, the first to have the Apple Desktop Bus interface for keyboards, mice and other input devices.

But to have a colour display we have to wait for the Macintosh II in 1987. A basic system with 20 MB drive and monitor cost about $5200. A complete colour-capable system could cost as much as $10,000 once the cost of the colour monitor, video card, hard disk, keyboard and RAM were added. This price placed it in competition with workstations from Silicon Graphics, Sun Microsystems and Hewlett-Packard.

As we see by its name the Macintosh Color Classic, is the first colour compact Apple Macintosh computer.

A totally different kind of user interface comes with the Newton Message Pad. It can be used with the screen turned horizontally as well as vertically. A change of a setting rotates the contents of the display. Afterwards this characteristic will be used for the iPhone.
Furthermore it features handwriting recognition, and the Newton Message Pad 110 model presents even a hand-printed-text-only recognizer.

From the same family comes the eMate in 1997, a predecessor of the iPhone and the iPad. Its green-coloured translucent durable case was designed for intense use in classrooms.

A redevelopment of Apple's original objective to create a device that would integrate into people's life, the TAM, is a wonderful computer designed by Jonathan Ive. UI is different and it represents a break point in the Apple history, as we will see later, overall in regard to design.

The simplicity idea grows with the cutting-edge iMac in 1998. In this model the attention was given to the out-of-box experience. The user needed to go through only two steps to set up and connect to the Internet. There was no step three.
It was the first Macintosh computer to have a USB port but no floppy disk drive. Subsequently, all Macs have included USB. Via the USB port, hardware makers could make products compatible with both x86 PCs and Macs. Previously, Macintosh users had to seek out certain hardware, such as keyboards and mice specifically tailored for the "old world" Mac's unique ADB interface, printers and modems with MiniDIN-8 serial ports. Only a limited number of models from certain manufacturers were made with these interfaces, and often came at a premium price. USB, being cross-platform, has allowed Macintosh users to select from a large selection of devices marketed for the Wintel PC platform, such as hubs, scanners, storage devices, USB flash drives, and mice. After the iMac, Apple continued to remove older peripheral interfaces and floppy drives from the rest of its product line.

Like the iMac, the iBook G3 had no legacy Apple interfaces. USB, Ethernet, modem ports and an optical drive were standard. The ports were left uncovered along the left side. A cover was thought to be fragile and unnecessary with the iBook's new interfaces, which lacked the exposed pins of earlier connectors.
Giving more than enough power for the most demanding uses, from desktop publishing to desktop movies, from playing ultra-realistic 3D games to playing DVD movies, Power Macintosh Cube is a computer shaped in a cube. It is also the first computer to come standard with an optical mouse, for perfect precision on almost any surface.
Apple figured out how to cool this enormous G4 power without even a fan, making this one of the quietest computers ever built at that time. The fan has always represented a problem for the noise produced. Nowadays, Apple, with the MacBook 2015, have finally and successfully avoid this problem, eliminating the fans and so the noise.

An extraordinary and drastic turning point in the user interface is caused by the creation of iTunes. With iTunes, Apple had made complex applications easy, and made them even more powerful in the process.
A good choice was to offer iTunes as a free download and installing it on every new iMac, to get people used to it and to bring them into the digital music revolution, started by Steve Jobs.
A clean interface (boxes) kept everything neat and reachable through a mouse click.

iTunes was not only the dramatic change of the user interface, but merely the start of a strategy that would redefine the company as more than a Mac maker. Apple wisely kept iTunes tied to the Mac, forcing Windows users to sync their iPods with Musicmatch, a sub-par jukebox that basically served as an advertisement for iTunes' sleek interface and finer points.

The user interface is different, new and easy to use. But overall it is the start of the digital hub era. From this moment on, Apple has tried to make the Mac a hub for all other digital devices. To synchronize them it was needed first a platform, which would have been iTunes, then devices to implement it, such as the Apple TV, iPod, the iPhone and the iPad.

The Apple TV came when Apple changed the company name from Apple Computer to Apple Inc. This underlined the intention in focusing more on lifestyle products for the general consumer.
It used a modified Front Row Interface (discontinued in 2011, when iCloud was born) using the Apple Remote. It is a particular product because it did not need a computer running iTunes to stream or sync content.

In the Apple TV 2nd generation all media was streamed instead of synced.[27] It was definitely a step forward the iCloud.

The peak of iTunes's path and of the digital hub era is iCloud, which is the outstanding evolution of the user interface. It allows the users to have their files available in different ways and places and on different devices.

The content shown is quite the same way on each single device. This has helped to homogenize several various user interfaces, converging them toward a unique simple and intuitive way to use the device.

The service provides its users with means to store data such as documents, photos, and music on remote servers for download to iOS, Macintosh or Windows devices, to share and send data to other users, and to manage their Apple devices if lost or stolen.[28]

The first tactile approach to the user interface comes along with the iPod 3th generation's Click Wheel. It is one of Apple's best interface innovations to date. The touch-sensitive wheel will be adopted for all the next iPods, only with few changes, until the iPod Touch, coming with the same multi-touch screen of the iPhone era.
In 2004 iPod interface involves photo and the next full-sized iPod even plays videos. The 80GB version included, among other things, a library-search feature. The iPod Nano 5th generation packed a video camera.

In September 2007 the iPod Touch revolutionized the iPod business. It brought the best mobile browsing experience to palms everywhere, offering the iPhone-like iPod experience many people had been holding out for.

Another step was done in 2008, when the user interface was improved to vision-impaired users, with iPod Nano 4th generation.
The iPod Shuffle 4th generation included VoiceOver. The VoiceOver feature made navigating fairly simple. By using this, the user can access their Macintosh or iOS devices based on spoken description.

[27] The device could also stream rented content from iTunes and video from computers or iOS devices via AirPlay. All contenti s drawn from online or locally connected sources.

[28] It replaced Apple's MobileMe service, acting as a data syncing center for email, contacts, calendars, bookmarks, notes, reminders (to-do lists), iWork documents.

The feature is designed to increase accessibility for blind and low-vision users, as well as for users with dyslexia.
So we can conclude that these devices could improve the quality of life. It is possible also thanks to the application such as FaceTime and iMessage introduced with the latest iPod Touch.

The innovative iMac G4 was another attempt to create an Apple ecosystem. The machine was sold with the Apple Pro Keyboard and Apple Pro Mouse, which would be later redesigned and renamed the Apple Keyboard and Apple Mouse, respectively. Optional Apple Pro Speakers, which were of better quality than the internal speakers, were also available. The Apple Pro Speakers use a unique adapter, designed to work only with a select few Apple Macintosh models.

And the ecosystem concept was widened with the introduction of new hardware, for instance iSight in 2003. This product existed next to the PowerBook G4 Aluminum, iBook G4 and the iMac G4.[29]

The iPhone EDGE is indisputably the start of a new kind of user interface. Steve Jobs, in the keynote of 2007, defines it as the Revolutionary User Interface. It is the result of years of Research and Development and of course it is an interplay of hardware and software.
At that time there were some smartphones such as BlackBerry, Moto Q, Palm Treo, Nokia E62. The problem with them was that their user interfaces is really sorted at the bottom of them. They all had keyboards, which were there, but they were not needed to be there. They had control buttons all fixed in plastic. But overall they were the same for every application, whereas every application wants a slightly different user interface, a slightly optimized set of buttons just for it.
Great ideas cannot be run on this kind of cell phone. It does not work because the buttons and controls cannot change. They cannot change for each application or, down the road, if you think of another great idea you want to add to these products.
This problem was solved in computers, twenty years before, with a big map screen, that can display anything, put any user interface up, and a pointing device, the mouse.
Thanks to Apple it was possible to take this to a mobile device, "getting rid of buttons and just make a giant screen."[30]

[29] The introduction of iSight coincided with Mac OS X Panther, which introduced iChat AV, bringing video conferencing to iChat. Success of iChat AV depended on the success of iSight, which may be why so much effort was put into this product. The iMac Aluminum features built-in iSight video camera for video conferencing and iLife '08, making it the ultimate digital lifestyle desktop computer for both consumers and professionals.

[30] Macworld 2007 Steve Jobs Keynote.

After the introduction of revolutionary user interfaces, mouse and click wheel, Apple brings the Multi-Touch technology to the market. And each of these revolutionary user interfaces has made possible of revolutionary products: the Mac, the iPod and now the iPhone.
The introduction of the multi-touch screen makes more actions possible. This new technology, firstly introduced by Apple, would allow people to use two or three fingers instead of just one. This means that the options and inputs could be more and more, and all without having the obsolete keys and buttons, and overall in a faster and reactive way.
It would afford much more sophisticated interfaces than simple-finger button presses. Keyboard, mouse, pen or even a click wheel now they were not necessary anymore.
The user would have touched the new interface, and this is obviously more intimate. Thanks to it the contact between the user and a sophisticated device is possible, and this will make the iPhone an indispensable device, part of people's lives around the world.

The computer OS was adapted into a brand-new operating system for the phone, giving birth to the famous SpringBoard. It is the standard application that manages the iOS home screen. It shows all the basic Apps available on the iPhone.
The SpringBoard has changed during years on iPhones and different devices, such as the brand-new product, Apple Watch, in which is very different and it can be used thanks to the digital crown. The device runs Watch OS, a variated iOS headed by vice president Kevin Lynch. Instead of the traditional springboard home screen found in iPhone or iPad, the Apple Watch runs a carousel of round icons that change in scale and position.

The iPhone's user interface has influenced computers' one. From the introduction of the iPhone we notice a high level of contagion by its user interface to computers and other devices, such as the MacBook Air 2008. New to it is a large multitouch trackpad, which lets MacBook Air users do the same kind of things iPhone users can.

But the most influenced device by the iPhone's user interface is the iPad. The iPad and iPhone's development projects were simultaneous and, not surprisingly, they shared numerous elements, including the UI.

The most intimate connection between a device and a person has been Siri, introduced by the iPhone 4s. It is a personal voice assistant that allows them to communicate vocally. It is able to receive commands and execute them. To make it more realistic Apple gave to it an ironic spirit. Thanks to FaceTime, Siri and other newer technologies, we do not just talk into our phones any more. We talked at them and from all around them.

When we speak of user interface, we speak mostly of the user, even the way in which he or she holds devices with hands. The iPhone requires one hand while the iPad two. After a study about the widths of hands around the world, Apple came out with a device that is comfortable for every kind of hand. The iPad Mini has been designed to be used one hand-and-a-halfed.
The iPhone 6 Plus is another example of one-handed device. The ease of use required your thumb be able to reach almost any area of the display, including the botton at the opposite corner.
The roundness, the lightness, the moving of the sleep/wake button from the top to the right, all help, but now so does the software.
Because the Home button's Touch ID sensor includes a capacitive ring to detect finger contact, it can also detect taps, just like the capacitive multitouch display. Double-tap the Home button and "reachability" mode activates, sliding the entire interface halfway down the screen, and bringing any icons, buttons, and other interface elements from the top to much more accessible positions.

About the contact between user and interface we can mention the Touch ID, Apple's biometric fingerprint identity sensor. This futuristic system is a simple and secure way to make the device recognize the user, through his fingerprints.
To make Touch ID secure, Apple implements a sophisticated system. When the capacitive ring around the sensor detects the presence of a finger, a high-resolution lens reads it. Once that fingerprint is read, it's converted to a mathematical hash and the original image is destroyed. That hash is then sent to the device's secure enclave, found within the Apple A7 chipset, and compared to any of the fingerprints registered there.

Through Touch ID it is possible to unlock it or even authorize purchases, simply with a touch of the finger on the Home button.
The first Touch ID was incorporate in iPhone 5s. It is currently available on iPhone 6, iPhone 6 Plus, iPhone 6s, iPhone 6s Plus, iPad Air 2, iPad Pro and the iPad Mini 3 and iPad Mini 4.

To simplify life of people, the iPhone 6, iPhone 6 Plus and Apple Watch both feature Apple Pay, a new transaction system, which combines the Touch ID with built-in Near Field Communications technology, in order to allow to tap-to-pay functionality.

2.2. Design and Colour

Jonathan Ive is Apple's Chief Design Officer and one of the most visionary designers in the world. He has provided a real breakthrough in Apple's products history. He changed many times the design of Apple products, giving them an elegant and innovative footprint. Its work has influenced many of the main changing characteristics: design most of all, colour as a consequence and portability, which has always fascinated him. Everything is dominated by simplicity and perfection. There are no frills and every detail is conceived to be essential and cutting-edge.

The entrance within the company of Ive will come later in 1997. The first period of Apple has been characterized by products featuring already an innovative design for that time. Nevertheless this was a trial and error phase, given that they were trying to define the image of the company.
Until 1997, the year when Steve Jobs returned to Apple after the period in which he was forced out, there were few design changes.
The disruptive point will be set in 1997 with the Twentieth Anniversary Macintosh and in 1998 with the iMac.
The period that comes from 1984 to 1990 have seen the presence of a design language, called Snow White.

The distinguishing characteristics originated by the Snow White Design Language, in contrast to the original Apple industrial design style, include the following:

- minimal surface texturing;
- colour a light off-white (Fog) or light grey (Platinum);
- inlaid three-dimensional Apple logo, diamond cut to the exact shape;
- zero-draft enclosures, with no variances in case thickness and perpendicular walls;
- recessed international port identification icons;
- silk-screened product name badging;
- shallow horizontal and vertical lines, 2 mm wide, 2 mm deep, spaced 10 mm apart on centre, which run along any and all of the surfaces of the product, some of which act as vents and setback 30 mm from the front and 4 mm from the back;

- Fog products have beige accents and cables, Platinum products have uniform colour (no accents) and Smoke grey cables;
- simple unadorned ports and slots.

The Apple IIc computer, and its peripherals, introduced Apple's Snow White design language, notable for its case styling and a modern look designed by Hartmut Esslinger which became the standard for Apple equipment and computers for nearly a decade.
Initially, Snow White debuted in a creamy off-white colour known at Apple as "Fog" but later other products moved to the warm grey "Platinum" colour, lighter than the previous Apple "Putty" colour, used throughout the Apple product line from 1987 on.
Esslinger favoured a bright-white colour originally for the IIc, but Jerry Manock successfully argued that it would attract fingerprints. Nevertheless, Esslinger did not like the original Apple beige-colour and insisted all Snow White-styled products use the same off-white colour as the IIc.
Macintosh Plus debuted in beige and then it transitioned to Apple's long-lived platinum-grey colour with the rest of the Apple product line. The keyboard's keycaps changed from brown to grey.
Until the change to Platinum, no Snow White designs appeared in any other colour, except for the Hard Disk 20SC in order to better match the beige colour of the Macintosh Plus beneath which it was designed to sit.
Apple IIgs used the Platinum colour scheme as well as the Macintosh SE.
Beginning in 1990, the Apple Industrial Design Group gradually altered and phased out the use of the Snow White language, as we will see.

The Macintosh Classic was the final adaptation of Jerry Manock's and Terry Oyama's Macintosh 128K industrial design (1984), bringing back some elements of the original, while retaining little of the Snow White design language used in the Macintosh SE's design.
Its front bezel was broad and curved and this characteristic became a signature of Apple products design for much of the 1990s.
After this will be abandoned in 2000 with Cinema Display.

In 1989 the Apple products design was revolutionised by a new and extremely innovative computer: the Macintosh Portable. Its hinged design covered the keyboard when the machine was not in use. The cursor pointing function was handled by a built-in trackball that could be removed and located on either side of the keyboard.

With Powerbook series is given importance to features that would later become standard in competing laptops, such as thinness, sharpness, and lightweight.

The first Macintosh to come made in black was the Macintosh TV in 1993. It shared the external appearance of the Macintosh LC 500 series, but in black. It came with a custom black keyboard and mouse.
This colour will be get back with the PowerBook 500 series, codenamed indeed Blackbird.
The eMate 300 featured a dark green-coloured keyboard similar to that of PowerBooks of the same era.
Purple, clear, red, and orange colored eMate prototypes were produced for show only and were never put into mass production.

However, the design that nowadays we all know comes from the strong relationship between Steve Jobs and Jonathan Ive. In 1997 Jobs returned to his company just in time to celebrate Apple's twentieth year.
For this anniversary Jony Ive was in charge of designing a new product: the TAM, also known as 20AM. The TAM was intended to break the established form factor of the personal computer. Its design was both a state-of-the-art futuristic vision of where computing could go as well as a redevelopment of Apple's original objective to create a device that would integrate into people's lives.
The TAM came with a unique 75 key ADB keyboard which featured leather palm-rests and a trackpad instead of a mouse. The trackpad could be detached from the keyboard if desired, with a small leather insert found underneath the keyboard ready to fill the gap. It also came with a remote control, which was standard with Apple TV.

A stunning explosion of colours happens in 1998. The iconic iMac came to the market, changing dramatically the Macintosh hardware. Until 1998, personal computers looked like beige boxes surrounded by tangles of peripherals and wires. Then came the iMac, the brainchild of Apple's head of design Jonathan Ive.[31]
With the iMac, he says, their brief was "to try and design the very best consumer computer we could". It had to look fresh and innovative, but also approachable.
The iMac was dramatically different from any previous mainstream computer. It came in several different colours and was made of translucent "Bondi Blue" - coloured plastic.
Its egg-shaped around a 14-inch (35.5 cm) CRT display will be find also in next computers such as iBook and PowerMac G3.

[31] Ive was born in Chingford, north London and went to college in Newcastle-on-Tyne. In the 90s, he established the quirky design group Tangerine and worked as a consultant for Apple, before moving to San Francisco with his writer wife Heather to work for the company full time in 1992. Sheryl, Garratt, "Technology innovator: Jonathan Ive, designer of the iMac", *The Guardian, Observer Magazine*.

Its unique shape and color options helped ingrain itself into late 1990s pop culture.
The keyboard and mouse were redesigned with translucent plastics and a Bondi Blue trim. The Apple USB Keyboard was smaller than Apple's previous keyboards, with white characters on black keys. The Apple USB Mouse was mechanical, of a round, "hockey puck" design. [32]

Extravagant patterns of the iMacs were then designed in 2001 to give them again a renovated image. The company would later drift from the multicolored designs of the late 1990s and early-2001s.

The colour began to be a distinctive trait also for other computers. The PowerMac G3 was commonly known as the “Blue and White G3”. It was introduced in 1999, succeeding the original “beige” Power Macintosh G3, with which it shared the name and processor but little else. The previous tower case was Quadra, and its design was totally different, belonging yet to the Snow White Design.

The same design of PowerMac G3 was conceived for Studio CRT Display, which was housed in a “crystal clear” enclosure.
Other two computers sharing same design characteristics are the Studio Display and the PowerMac G4 in which is present the familiar “graphite” case debuted on 2001.

The iBook is certainly the next in line product after the iMac. It also echoes the eMate 300.
Three distinct designs of the iBook were introduced during its lifetime. The first, known as the "Clamshell", was influenced by the design of Apple's popular iMac line at the time. However, unlike the iMac, the iBook did not use pinstripes.

It was a significant departure from previous portable computer designs due to its shape and bright colors.

Apple continued its trend of using transparent colored plastics for the shell. Compared to follow-up iBook and PowerBook notebook computers, the Clamshell iBook proved to be the more reliable model.

[32] Apple continued shipping the round mouse, adding a divot to the button in later versions so that users could distinguish proper orientation by feel. Eventually, a new capsule-shaped optical mouse, known as the Apple Mouse (formerly "Apple Pro Mouse"), replaced the round mouse across all of Apple's hardware offerings.

Vestiges of design ideas first adopted in the iBook G3 can still be seen today: moving interface ports from the back to the sides and leaving them uncovered, omitting a latch for the computer's lid and providing color options and an eye-catching design intended to be seen with the computer open.

The iMac DV follows the design trend of its predecessor, but now showing the inside thanks to a transparent, new clear graphite-coloured enclosure.

With the start of the new millennium, in 2000, the second generation abandoned the original form factor in favor of the more conventional, rectangular design of the PowerBook G3.
The Kanga was also notably smaller in depth and width than the subsequent Wallstreet Powerbooks, and the Kanga remained the smallest-when-open G3 laptop until the debut of the Apple iBook some years later.
Whereas PowerBook G3 Wallstreet series was completely redesigned with a new case that was lighter and more rounded than the previous PowerBook G3.
Lastly, G3 series Bronze Keyboard was much slimmer and lighter than its predecessor. The keyboard was improved and now it featured translucent bronze-tinted plastics, which is the origin of the "bronze keyboard" nickname.

The name of Sir Jonathan Ive comes again with another disruptive Apple product, this time with the Power Macintosh G4 Cube. It is engineered into an eight-inch cube, small, suspended in a stunning acrylic glass and crystal-clear enclosure and sold with its distinctive Harman Kardon transparent speakers. All these design characteristics make it a state-of-the-art piece in Apple history.

There have been three designs for the Cinema Display, one featuring polycarbonate plastic and two featuring anodized aluminium. The first displays were designed to match the colorful plastic of the Power Mac G3 and later the Power Mac G4, while the second revisions were designed to match the more professional aesthetics of the Power Mac G5 and PowerBook G4.

The PowerBook G4 had two different designs: one enclosed in a titanium body with a translucent black keyboard and a 15-inch screen; and another in an aluminium body with an aluminium-coloured keyboard, in 12-inch, 15-inch, and 17-inch sizes.

Between 2001 and 2003, Apple produced the titanium PowerBook G4; between 2003 and 2006, the aluminium models were produced. When the aluminium PowerBook G4s were first released in January 2003, however, only 12-inch and 17-inch models were available. The 15-inch retained the titanium body until September 2003, when a new aluminium 15-inch PowerBook was released.

The initial design of the PowerBook G4s was developed by Apple hardware designers Jory Bell, Nick Merz, and Danny Delulis. The ODM (Original Design Manufacturer) Quanta[33] also helped in the design.
The new machine was a sharp departure from the black plastic, curvilinear PowerBook G3 models that preceded it. Apple's industrial design team, headed by British designer Jonathan Ive, converged around a minimalist aesthetic, the Titanium G4's design language laid the groundwork for the Aluminum PowerBook G4, the MacBook Pro, the Power Mac G5, the flat-screen iMac, the Xserve, and the Mac mini.

In 2001 the *colourful era* definitely ended. The previous bold colours and bulky form-factor were abandoned. The concept of *snow* comes back revised with the iBook G3 Snow. It was available in white only and incorporated transparent polycarbonate in its casing. It was 30% lighter, and occupied less than half of the volume of the model it replaced, being smaller in all 3 dimensions.

Apple began transitioning to translucent and white polycarbonate casings in most of its consumer line, such as the iMac and the eMac.
In contrast, most of its professional products used an anodized aluminium finish. Near the end of its run, the Snow iBook G3 case became opaque and white instead of translucent white and magnesium.

When iPod was introduced its colour and design proceeded with computers' ones. From first to fifth generation, iPods were white and their design was quite steady, with few changes and exceptions. For instance the iPod Mini in 2004 came in five snazzy colours (silver, gold, pink, blue and green).
The following year was introduced a device totally different in design, the first iPod Shuffle. It was smaller, slimmer and more elegant.
But the real iPod revolution in design happens with the iPod Nano. Its futuristic design distinguishes it from the others. It represents a pivot product. It was launched only in black and white, then shipped in various colours.

The design and colour remain more or less the same until a renovated edition of the iPod Shuffle. It came in the form of a clip. It featured the anodised aluminium casing and the choice of several colours.

[33] Quanta Computer Incorporated is a Taiwan-based manufacturer of notebook computers and other electronic hardware. It is the largest manufacturer of notebook computers in the world. Its customers include Apple Inc., Compaq, Dell, Gateway, Hewlett-Packard, Alienware, Amazon.com, Cisco, Fujitsu, Gericom, Lenovo, LG, Maxdata, MPC, BlackBerry Ltd, Sharp Corporation, Siemens AG, Sony, Sun Microsystems, Toshiba, Verizon Wireless, and Vizio.

In 2007 the path of the iPod Touch crosses the iPhone's one. The iPod's design matches the iPhone's one. They are identical and iPod brings most of the features of the iPhone. They differ only in the software component, but the design is conceived to bring the idea of the iPhone to customers' minds. From this moment on, everything has been designed to create an ecosystem of products that have the same elegant, essential and simple footprint.

The design of the iMac G4 is famous and unmistakable for its display mounted on an adjustable arm above a dome-shaped bottom. The arm allowed the display to hold almost any angle. This made it recognizable also thanks to some funny advertisings, showing it reacting to every move made by a passer-by on the street. Apple advertised it as having the adjustability of a desk lamp.
The iMac G4 was sold only in white, and was not translucent like the iMac G3. Instead G4 was similar in colour to the Power Macintosh belonging to its family, given that its doors were "mirror finished".

About the materials, Jonathan Ive, heading the Apple's Industrial Design Group, decided to move from titanium to aluminium. The early PowerBook G4 models really made of Titanium. The cases used by early PowerBook G4 models are made of 99.5% pure grade CP1 (commercially-pure) Titanium with a rigid carbon fiber frame. Instead the PowerBook G4 is created using aluminium, which was surely less expensive than titanium.
The iSight is one of the first Apple products to use aluminium as it primary housing material. The PowerBook G4 was the first to do so in early 2003 and then the iSight and Power Mac G5 followed suit later that year.
The 2003 eMac design closely resembles the first-generation iMac. It was the entry-level model beside the iMac and the G4, which covered the premium target, but it was not in aluminium.

In August 2004, the iMac design was overhauled with the iMac G5. The approximately two inches deep enclosure is suspended above the desk by an aluminium arm. It was a marvel of miniaturization housed in a completely new enclosure reminiscent of Apple's Cinema Display line.

MacBook brand was the "world's top-selling line of premium laptops." There have been four separate designs of the MacBook.
The original model used a combination of polycarbonate and fiberglass casing which was modeled after the iBook G4. While thinner than its predecessor, the iBook G4, the MacBook was wider than the 12-inch model due to its widescreen display. It was available in black or white colours. In addition, the MacBook was one of the first (the first being the MacBook Pro) to adopt Apple's MagSafe power connector and it replaced the iBook's mini-VGA display port with a mini-DVI display port.

While the MacBook Pro largely followed the industrial design standard set by the PowerBook G4, the MacBook was Apple's first notebook to use features now standard in its notebooks (the glossy display, the sunken keyboard design and the non-mechanical magnetic latch).
With the late 2007 revision, the keyboard received several changes to closely mirror the one which shipped with the iMac, by adding the same keyboard short-cut to control multimedia, and removing the embedded numeric keypad and the Apple logo from the command keys.
A more expensive black model was offered until the introduction of the unibody aluminum MacBook. The polycarbonate MacBook was the only Macintosh notebook (until the new 2015 model) to be offered in more than one color since the iBook G3 (Clamshell).

The second type, introduced in 2008, shared the more expensive laptop's unibody aluminium casing.
Instead the third design in late 2009 had a polycarbonate unibody casing.
A new, redesigned MacBook line, as we will see later, was launched on March 9, 2015. Available in silver, gold or space grey, it is thinner than the MacBook Air and removes the traditional MagSafe charging port (along with all other ports, except the headphone port) in favor of the multi-purpose USB Type-C port.

The cultural icon iPhone EDGE has a stunning design, featuring a gently curved back snapped seamlessly onto the screen, like the original iPod. Most importantly, it had Jony's infinity-pool illusion, which is perceived thanks to the screen, one of the next characteristics analysed.
When the phone was off, it appeared to be a single, unbroken, inky-black faceplat; when switched on, the screen magically appeared from within.
The front face bore neither the company logo nor the name of the product. ' We also knew from our experience with iPod ', Stringer explained, ' if you make a startlingly beautiful e original design, you don't need to. It stands for itself. '

The next generation iPhone, iPhone 3G, used a slightly thicker case, with either a black or white plastic back, rather than aluminium like the original model. Whereas the iPhone 3Gs diverges from only for the software component, and not for the hardware.

Apple took a completely different approach to ultralight notebook computers with the MacBook Air (MBA). New to the MacBook line is a large multitouch trackpad. The MacBook Air has the same footprint as the MacBook, but it's 2.2 lb. lighter.

With the MacBook late 2009, called White Unibody, we notice a different glossy white unibody case design. Like the aluminium "Unibody" models, this system also has a four-finger "multi-touch" glass trackpad and an integrated battery design.
It uses polycarbonate rather than aluminium and has a non-skid rubberized bottom surface. The material used for this surface is aluminium, but rubberized. In my opinion this is the best way to do a bottom surface. The thinness is very important for technological products and it could take years of hard work to reach a level of thinness that is confortable and consistent with the customer needs. A thin layer of rubber helps this goal. Small feet, like those used in the latest MacBook, would cancel the hard work, by lifting the base of the computer from the surface on which it is resting. In this way the basis would be higher and uncomfortable for the end user.

Surely the design of iPhone 4 revokes its predecessor, even if was heralded as “the biggest leap since the original iPhone”. It uses an all stainless steel body design. Mobile and data antennas are integrated in the "metal band" that wraps around the sides of the phone, and a chemically hardened "aluminosilcate" glass front over both the display and a black frame and the chemically hardened black glass back as well (it was introduced with a white option on June 7, 2010, too, but this version did not ship until April 28, 2011). Regardless of color, both the front and back have an "oleophobic" oil repellent coating.

On 27 January 2010, Steve Jobs went public with Apple's newest game changer. He announced the iPad at the Yerba Buena Center for the Arts in San Francisco, positioning it as a device that exists between an iPhone and a laptop. He distinguished it from netbooks, describing the iPad as a device more 'intimate than a laptop', conveying the sense that the iPad was at the intersection of both technology and art.

The iPad 2 was thinner and lighter than the original. It gained key new features like front and back cameras, as well as thoughtful touches like a magnetic cover that turned the iPad off and on.

The iPhone 4s is a gradual step over the iPhone 4 improving the internals, but keeping the look and feel. The iPhone 4S is almost identical in appearance to the iPhone 4. The only visible difference comes courtesy that new antennae design. On both phones the antenna is incorporated into the stainless band that wraps round the edge, and famously on the iPhone 4 this lead to problems when the phone was held such that your hand or fingers covered the thin strips of black plastic that seperated the aerial into segments. On the iPhone 4S these black strips have doubled in number, indicating the phone's use of two antennae. Thanks to having to incorporate these extra black strips, the mute switch on the left edge has had to move closer to the volume buttons.

The front and back are formed of two slabs of toughened glass that are incredibly resistant to everyday scratches though prone to shattering if dropped.

But the “biggest thing to happen to the iPhone since the original iPhone” is the iPhone 5. It is big as in tall, light, LTE. The design is completely renovated and more refined.
Though the overall rounded-rectangle shape of the iPhone 5 stayed the same, Apple rebuilt the casing from the atoms on up.
Although the screen got bigger, paradoxically the iPhone 5 itself got smaller (12% smaller by volume than its predecessor).
Apple offered both white and silver (Stormtrooper) and black and slate (Vader). The silver was clear-coated aluminium while the slate was anodized.
Apple wasn't able to include a better physical camera but they somehow managed to squeeze a camera into the iPhone 5 that was just as good as the iPhone 4S.
Apple also claimed the 5-element lens has been aligned with even greater precision for even greater sharpness. Also, the surface of the iSight was switched to sapphire crystal to make it more scratch resistant.

After 10 years of 30-pin Dock connector, Apple swapped it out for the smaller, more flexible, more advanced Lightning connector, 80% smaller.
The iconic earbuds were also updated for the iPhone 5, becoming EarPods. The shape of the EarPods was a significant divergence: instead of being uniformly round, the EarPods were asymmetrically shaped and, according to Apple, ergonomically designed to better fit a wider range of ears.

Unlike the last 3 generations of iPad, the iPad mini (2012) benefits from every bit of advancement Apple's made in its manufacturing process. While the front looks the same as the larger iPad, indeed the same as every iOS device, the back and sides now sport the ultra-modern iPod touch 5 look.
The same anodized aluminium, flat backed, rounded edged, metal buttoned, mono-crystalline diamond-cut chamfered design that wraps the new iPod touch wraps the new iPad mini.
The iPad mini also comes in the same black-and-slate and white-and-silver color options as the iPhone 5 and iPod touch 5.

The original iPhone had been available only in aluminium and black. The iPhone 3G and iPhone 3GS had black front plates but offered both black and white back plate options. The iPhone 4 and iPhone 4s had come, front and back, in black or white. The iPhone 5 was two tone, but those tones were still black and slate gray, and white and silver. The iPhone 5s added white and gold.

iPhone 5s is a device packed in beautiful and refined design, breakthrough features that really matter to people. It kept the same design as the previous iPhone 5. The same aluminium was kept as well, with its ceramic glass inlays on the back for RF transparency and its diamond chamfered edges.

To evoke the explosion of colour happened inside Apple in 1998, is the iPhone 5c. Apple had previously done with the iPod lineup, including the iPod touch, having a dedicated device at a lower-price point let them use colour as a differentiator. Set against the traditional black/slate and white/silver of the premium line, the iPhone 5c popped in plastic tinted bright green, blue, yellow, pink, and white.
They repackaged it as something new. It replaced the aluminium casing with polycarbonate. Apple had used plastic casings before for the iPhone 3G and iPhone 3GS. For the iPhone 5c, however, they put it around a metal frame so it felt rock solid. They called it "unapologetically" plastic and it was.
There was always some overlap of shapes, of rounded rectangles and circles, but Apple made sure to coordinate the colors of the iPhone 5c casings with the palette of the iOS 7 icons, text, and tints.
It wasn't packaged like previous iPhones, in a box and meant to sit in back-of-house. It was packaged like an iPod in a clear plastic case that let its color shine through to entice anyone walking by.

The iPad Air design makes it similar to an iPad and an iPad Mini. iPad Air is the name given to the iPad 5. It brings with it a new design that looks a lot slimmer and feels a lot lighter, just like the iPad Mini. Its chassis is in glass and aluminium.
The physical transformation from iPad to iPad Air is the single most important update to Apple's full-sized tablet, and alongside the iPad 2 redesign, one of the most important updates in the brief history of the device.

The iPhone 6 is focused on roundness and screen, indeed later we will be able to notice the importance given to the quality of the image. The touch is improved and the feeling holding it is totally different. It is more personal and intimate. It is simply in the hands, and there are rounded edges. For this reason it revokes the iPhone EDGE design.
The iPhone 6 Plus looks like a bigger, bolder iPhone 6. It is identical except for the size. Same iconic shape and Home button, same newer, thinner casing. Same new sleep/wake button placement along the side, same raised camera ring, microphone styling, and backplate with radio-transparent lines cutting across the aluminium.

The iPad Mini 3rd generation looks almost identical to the iPad mini 2, which looked almost identical to the original iPad mini. The main differences comes in the form of the Touch ID sensor, which

replaces the old, dumb Home button with a smart one that can identify who we are, and an optional gold finish.

The latest products by Apple are extremely innovative and the latest design is focus on lightness and thinness.
The incredibly thin design of the iMac with Retina Display is amazing. It is just 5 mm at its edge.
Apple has designed the new MacBook to be not only lighter and thinner, but more functional and intuitive than ever before. To do that, Apple started from scratch, reinventing each essential element as part of a singular, deceptively simple design.

The new MacBook 2015 redefines what it means to be a laptop. The company has done it with plastics and metals, and even with envelopes. With this latest MacBook, the first to bear just that simple name since 2011, even the constants of screen, keyboard, and trackpad have changed. They've gone Retina, Butterfly, and Force Touch respectively. The differences are easily observed. It's metal now, not plastic. That makes the new MacBook feel even more like a singular object.
The MacBook is also anodized now, so just like iPhones and iPads it is possible to choose between space gray, silver, and gold finishes.

It is polished and simple, like the iPhone 6 and iPad Air 2. The word "MacBook" appearing at the bottom is something Apple has stopped doing with the more recent MacBook Pro iterations.
Gone also is the glowing Apple logo on the back. The sight of it everywhere from coffee shops to the State of the Union to Microsoft's media events was impossible to miss.

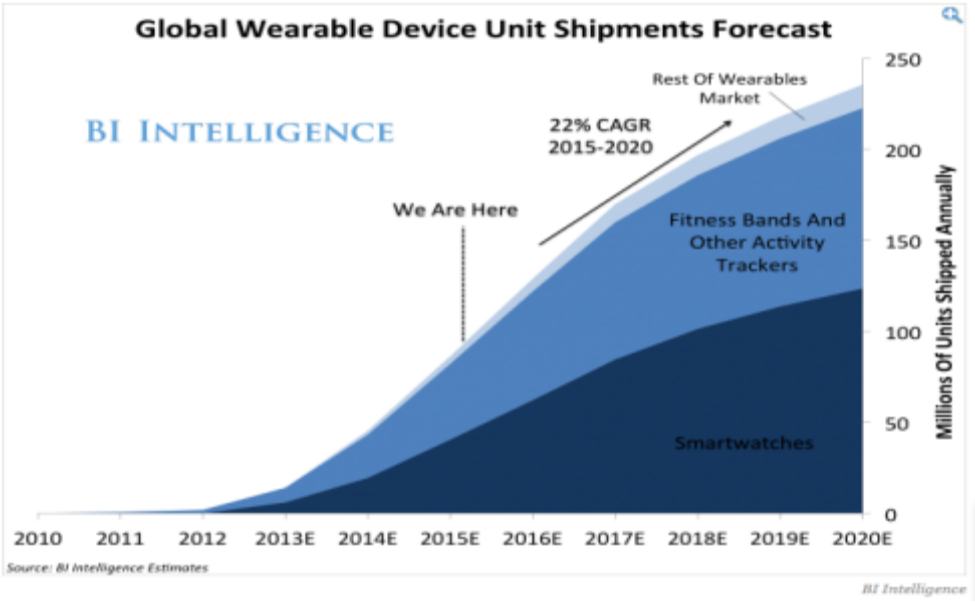
The ultimate and irresistible Apple Watch is designed in three versions, using different colours and respectively three materials: stainless steel for the Apple Watch collection, anodized aluminium, as much of its predecessors, for sport use, and gold which has never been used before.
Pink gold has given birth to a new era: the start of luxury technological wearable devices.

2.2.1. The introduction of Apple in luxury watches market

The pricing, materials, and design on certain models makes the Apple Watch the first smartwatch to compete in the luxury-wristwatch category.

Apple's trusted, high-end brand gives the smartwatch category immediate influence and helps drive much more interest among consumers, particularly those attracted to luxury goods.

In a report (updated to 2015) on the smartwatch market and the luxury wristwatch market, Business Insider Intelligence takes a closer look at the opportunities for Apple's wearable device and how it might impact the market for luxury watches.



According to Business Insider Intelligence:

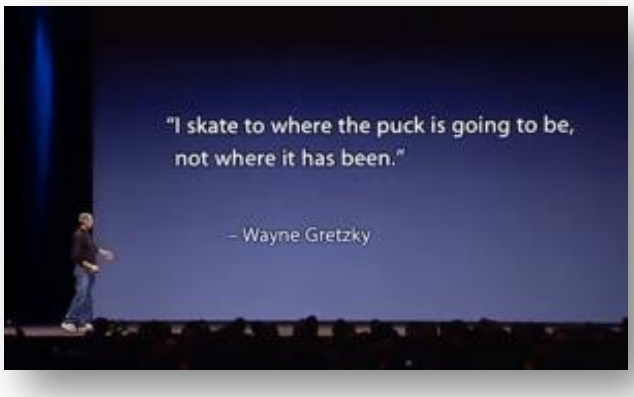
- Smartwatches, and the Apple Watch in particular, will be the device category that drives overall growth in the *wearables* market over the next four years. Wearable computer shipments will grow 22% per year on average through 2020, to reach 235 million units shipped annually in that year.
- Smartwatches will grow 25% per year on average through 2020 and will make up 52% of total wearables shipments in that year. Fitness bands have more limited functionality and will cater to a more niche, health-focused audience.
- Apple Watch will compete not only with other smartwatches but in the traditional luxury-wristwatch category as well. There have been 3.6 million Apple Watch shipments in the last quarter of 2015. Buiness Insider Intelligence have forecast an average growth of 24% per year through 2020.
- In regard to the retail distribution strategy the introduction of the Apple Watch will mark Apple's first opportunity to distribute a product through apparel and jewelry retailers, including

department stores. Retail consumers will take to Apple Watch as a symbol of status and as a fashion-forward accessory, much like a traditional luxury wristwatch.

- By 2020, Apple Watch shipments will be equivalent to about two-fifths of the luxury-watch market. Traditional wristwatches would account for ~60% of total shipments in 2020, while Apple Watch would account for ~40%.

2.3. Portability

This element maybe is the most interesting and fascinating to study. Portability is a concept that has always been taken into consideration by Apple during its history. This characteristic has to be improved and innovated to satisfy always more consumer needs. From the start till nowadays the more technology has been part of people's life, the more are increased peoples' needs. Different devices surround us and we interact with them. This phenomenon pushes the need to have always available and more reachable devices to be always updated, even wearing them. Apple as we have seen is a pioneer company: the team works on innovation technologies thinking already how to make them obsolete.



The path from the simple *portable* to the more intimate *wearable* lasted for more than thirty years.
It all started in 1984 with the Apple IIc. It was the portable version of Apple IIe. It had a carry handle, which helped to introduce the portability in people's mind. While relatively light-weight and compact in design, the Apple IIc was not a true portable in design as it lacked a built-in battery and display.

The real portable computer was launched in 1989. The Macintosh Portable is the first battery-powered portable Macintosh personal computer. It was received with excitement from most critics but consumer sales were quite low.

In 1991 the Powerbook 100 series introduced a laptop computer. It incorporated features that would later become standard in competing laptops, like for instance the built-in trackball, the shape and design. While in 1992 was released a hybrid portable/desktop computer: the Powerbook Duo, then followed by the Powerbook 150 and the Powerbook 500 series.

Definitely a step toward the future was done with the Newton Message Pad in 1993 and the Newton Message Pad 110. The concept of portability is expanded. We can notice same elements that revoke even the iPhone (2007): the screen that could be turned horizontally as well as vertically; a large screen; the logo on the bottom, then replaced by the Home Button.
Another device similar to the iPhone and the iPad was the too innovative eMate, a personal digital assistant.

The iMac ’98 had a handle built into the top of the computer. Jonathan Ive explained the decision, saying, "Back then, people weren't comfortable with technology. If you're scared of something, then you won't touch it." He continued, "I thought, if there's this handle on it, it makes a relationship possible. It's approachable. It's intuitive. It gives a sense of its deference to you." At the old Apple without Jobs, Ive's handle would have never been approved because it was a superfluous feature that only added cost. At the new Apple with Steve Jobs in charge, the handle stuck. Every detail is there for a reason.

The handle on the iMac helps you carry it, for instance, but subconsciously it also tells the technophobe that this machine isn't fragile, that it's made to be handled.'
Also the iBook Clamshell's case included an integrate carrying handle.
Unlike the iMac G3, the eMac is not meant to be portable as it weights 50 lb (23 kg) and lacks a carrying handle.
The handles were not included in the Powerbook G3, Powerbook Titanium G4 and were abandoned with models from the iBook G3 Snow on.

The music revolution to which Apple gave birth in 2001, started with iTunes and iPods that made thousand of songs and podcast available everywhere. The user started to bring with him or her devices such as the iPod Mini that could have been loved by joggers and young teens everywhere. To the third-generation iPod shuffle was added a clip to attach to the shirt sleeve. And the fourth generation iPod Shuffle naturally still houses a massive clip on the back, to make the *music portable*.
The sixth generation iPod Nano could be seen as an ancestor of the Apple Watch. It is possible to pop it on a wrist-strap (calling to mind the watchband of the Apple Watch) and set it to display up to 16 different clock faces (just like one of the several functions of the Apple Watch).

In 2003 with the transition from titanium to aluminium comes the Powerbook G4 Aluminum. Apple stated that the 12-Inch PowerBook G4 was its "smallest notebook ever", which as some have noted, is true if is measured the volume of the notebook, but compared to the long-discontinued PowerBook Duo 210, the 12" PowerBook G4 is thinner (by 0.22 inches), but it is slightly deeper (by 0.1 inch) and heavier (by 0.4 pounds).
In promotional materials, Apple said that titanium's superior tensile strength and low density give it the greatest strength-to-weight ratio of any of today's structural materials, which enable to build the thinnest and lightest full-featured portable supercomputer on the planet, without having to make the kinds of tradeoffs that would compromise its performance. However, cases used by PowerBook G4 models starting on January 7, 2003 use less expensive aluminium rather than titanium.

With the launch of the iPhone EDGE, Apple brings in one hand not only an entire computer but the entire world and a new way to communicate and live.
Jony Ive in particular had always had a deep appreciation for the tactile nature of computing; he had put handles on several of his early machines specifically to encourage touching. But here was an opportunity to make the ultimate tactile device, as it has been.

Over the years an improved component is the battery both for notebooks and for iPhones and other devices. The goal is to allow to use the device more time and even if the user spends all the day out.

To encourage and simplify the portability, Apple creates ultralight notebook computer, such as the MacBook Air. Its thinness and lightness allow to bring it everywhere.

To satisfy the need of portability in 2010 Apple introduced the iPad, the newest game changer. It is a device that revolutions both the computer and the iPhone idea. It is so light and thin that the users can bring it with them and reinvent the concept of a simple desktop laptop. The iPad is not more laying on a surface, but it is held in the hands, you can touch and feel it. You can feel the applications in your hands, and so have a best experience using it. The iPad can be brought in a bag easily and can be used everywhere for everything.
Together with distinctive covers design, as all the best part of products conceived by Ive, it has become a fashion icon, sometimes even an accessory. And this has aroused a reaction in the bag and suitcase market, in fact it does not exist more the laptop bag, but the laptop and iPad bag or even only the one which only brings the pocket for the iPad.

About the iPad prototype, Jony spotted the problem. It needed a cue, some signs that it was friendly and could be picked up easily with just one hand. As usual, Jony wanted to invite users to touch the device, pick it up and hold it and have a tactile experience.
One of the later prototypes featured a pair of large plastic handles, making it look like clunky and inelegant. When they realized the handle approach clearly was not working, Jony's team started exploring a tapered back that swept away underneath the screen, opening a gap for fingers to slide underneath.

In 2012, the iPad Mini was launched. The Mini provides all the iPad functionalities, but now in a more manageable size. They created a new screen size, screen resolution and aspect ratio, and initially used a lower pixel density.
In 2013 the iPad Air comes to the market with a renovated design intended to be carried. And in 2014 the iPad Air was improved to use it outside. Apple pegs the reduction in glare at 56 percent. The real difference is that it becomes usable in places where previous generation iPads just wouldn't be functional.

Apple reaches the peak of data portability in 2011 with iCloud. The cloud storage and cloud computing service allows to have all the data available on all the users' devices. It allows starting a work on a device and finishing it on another or another again. Thanks to this system it is possible to have always everything under control and it is quite impossible to lose important files. Apple with this service does another step toward the future and the limitless portability.

The new MacBook is a highly portable laptop. Apple's 12-inch Retina MacBook (early 2015) is 13.1mm thin, weighs 907g, has a new keyboard and trackpad. It is the slimmest and lightest laptop ever built up to now.

Not by chance it is produced only in 12-inch, remembering an iPad Pro with a keyboard.

The concept of portability is enlarged and revolutionized once again and transformed to wearability. The device is on your wrist. The Apple Watch is the most personal computer ever conceived. It is small and simple to use. It is not only with you but it is on you.

Innovation is studied in every interaction. Apple has invented all-new ways to select, navigate, and input that are ideally suited to a smaller device worn on the wrist.

2.4. Screen and Display

In the fist models there were no screens but the computer had to be connected to a monitor. Then, together with the evolution of the UI, the display has become something of extremely necessary and every computer came with a monitor.

In the very beginning, Apple did not manufacture or sell displays of any kind, instead recommending users plug-into their television sets or expensive third party monochrome monitors.
However, in order to offer complete systems through its dealers, Apple began to offer various third party manufactured 9" monochrome monitors, re-badged as the *Monitor II*.

Apple's manufacture history of CRT displays began in 1980, starting with the Monitor /// that was introduced alongside and matched the Apple III business computer. It was a 12" monochrome (green) screen that could display 80x24 text characters and any type of graphics, however it suffered from a very slow phosphor refresh that resulted in a "ghosting" video effect.

Roughly 4 years later came the introduction of the Apple manufactured Monitor //, which as the name implies, was more suited in look and style for the Apple II line and at the same time added improvements in features and visual quality.
In 1984 a miniature 9" screen, called the Monitor IIc, was introduced for the Apple IIc computer to help complement its compact size. This monitor was also the first to use the brand new design style for Apple's products called *Snow White*, as well as being the first monitor not released in a beige color, but rather a bright, creamy off-white.

In 1986 came the introduction of the AppleColor RGB Monitor, a 12" analog RGB display designed specifically for the Apple IIGS computer. Also introduced that year was the Apple Monochrome

Monitor, which cosmetically was identical to the former model but was a black and white composite display suitable in external appearance for the Apple IIGS, Apple IIc or Apple IIc Plus.

LCD Displays

The history of Apple LCD displays started in 1984 when the Apple Flat Panel Display was introduced for the Apple IIc computer, principally to enhance the IIc's portability. This monochrome display had an odd aspect ratio (making images look vertically squished) and required a very strong external light source, such as a desk lamp or direct sunlight to be used.

Portable Displays

The next attempt at a flat panel was with the Macintosh Portable. More of a desktop than laptop, it had a built-in high-resolution, active-matrix, 1-bit black & white, 9.8" LCD display with 640x400 resolution. Like the IIc Flat Panel, it was not backlit and required a bright light source to be used. A second generation model rectified that situation.
Commencing with the PowerBook series, built-in LCD flat-panels became standard across the portable line, following an industry-wide evolution from grayscale to color and ranging from 9" to 17".

Two primary technologies were used, active matrix (higher quality and more expensive) and passive matrix displays (lower quality and cheaper). By 1998 all laptops would use the standard active-matrix color LCD with a standard average dimension of 13", except for the Newton products and eMate portables.
Apple's current MacBook portable displays include LED backlighting and support between 1280×800 to 2880×1800 pixel resolution.

All-in-ones

In 1997, Apple released the Twentieth Anniversary Macintosh (TAM), the first all-in-one portable like the CRT models before it, with an LCD screen. Drawing heavily from the PowerBook technology, the TAM featured a 12.1" active matrix LCD capable of displaying up to 16bit color at 800x600. While Apple chose to return to traditional and cheaper CRTs for its integrated display desktop line for the next 4 years, the TAM is undoubtedly the predecessor for the successful LCD-based iMac line of all-in-one desktops starting with the iMac G4 released in 2002. A substantial upgrade over the TAM, it contained a 15" LCD supporting up to 1024x768 resolution.

It was followed by a 17" and 20" models boasting resolution of up to 1680 × 1050. In 2005, the iMac G5 dropped the 15" configuration and in 2007, the new iMac dropped the 17" and added a 24" to the line-up, further boosting resolution to 1920 x 1200.
In October 2009, new iMac models moved to 16:9 aspect ratio screens at 21.5 and 27 inches.
In 1999 we have the last CRT Display produced by Apple, the Studio CRT Display.

External Displays

The first desktop flat-panel was introduced on March 17, 1998 with the 15" Apple Studio Display (15-inch flat panel) which had a resolution of 1024x768.
After the eMate, it was one of the first Apple products to feature translucent plastics, two months before the unveiling of the iMac. Apple called its dark blue color "azul".
In January 1999 the coloring was changed to match the blue and white of the new Power Macintosh G3s, and the connector changed to VGA.

The 22" widescreen Apple Cinema Display was introduced in August 1999, simultaneously with the Power Mac G4 and in the beginning was sold only as an option to the Power Mac G4, selling for US$3,999.
The display had a striped look on the bezel, similar to previous Studio Displays and iMacs. In December, the colors of the 15" display were changed to "graphite" to match the new Power Mac G4s, and the input was changed from VGA to DVI, the audio and video features dropped, and the ADB functionality replaced by a two-port USB hub.

In 2000 the 22" Cinema Displays switched to the ADC interface, and the 15" Studio Display was remodelled to match the Cinema Display's easel-like form factor and also featured the Apple Display Connector. In 2001 an LCD-based 17" Studio Display was introduced, with a resolution of 1280x1024. In 2002 Apple introduced the Cinema Display HD which had a 23" widescreen display with a resolution of 1920x1200. In 2003 Apple introduced the 20" Cinema Display to replace the now discontinued 22" display and it had a resolution of 1680x1050.
LED backlights

With the introduction of the Macbook Air and later the Unibody MacBook family, Apple introduced their first desktop display to use both the brand new Mini DisplayPort connector, but also an LED backlit screen.

In 2010, display size was boosted to 27" and resolution was boosted to 2560x1440. In 2011 this display was rebadged as Apple Thunderbolt Display, and its connector was changed to Thunderbolt. While the non-Thunderbolt model can still be purchased for older Macs, the 27" is Apple's only external display size as of 2012.

Matte vs glossy screen

Since the transition on October 14, 2008 to the Aluminum models, Apple removed the matte, anti-glare screen as an option for its Cinema Displays. As a consequence, the Cinema Displays have been available from Apple only with a glossy screen. Apple removed the matte screen option from its line of iMac desktop computers on August 7, 2007, so Apple does not offer any desktop equipment with a matte, anti-glare screen. This has caused concern among a segment of users that desire matte screens for their particular area of work, for example, graphic designers, photographers, and users that view their screens for many hours per day.
The Wall Street Journal referred to Apple's removal of the matte screen as one of Apple's worst design decisions.

Retina Display

Retina Display (marketed by Apple with a lowercase 'D' as Retina display) is a brand name used by Apple for screens that have a higher pixel density than their previous models.
A marketing term adopted by Apple, *Retina* means the display density is high enough that, when held at a normal viewing distance, individual pixels disappear and all someone with 20/20 eyesight can see is the content. This happened in print media decades ago, it happened with products such as the iPhone in 2010, the full-sized iPad in 2012, and now the iPad mini in 2013.
The goal of Retina Displays is to make the display of text and images extremely crisp, so pixels are not visible to the naked eye. This allows displays to rival the smooth curves and sharpness of printed text and immediacy of photographic prints.

They double the pixels both horizontally and vertically, resulting in four times as many pixels in the same physical space. In other words, take a standard pixel, divide it into four, and you have Retina pixels. So, if you see something small on the screen, even a simple shape like a circle, instead of the cruder, standard density, you get the much finer Retina result. That translates into crisper text, cleaner lines, and sharper images.

These better quality displays have been gradually released over a number of years, and the term is now used for nearly all of Apple products containing a screen, including the Apple Watch, iPhone, iPod Touch, iPad, Macbook, MacBook Pro, and iMac.
Apple uses slightly different versions of the term for these models, including *Retina HD Display* (iPhone 6 models), and *Retina 5K Display*, *Retina HD Display* or *Retina 4K/5K Display* (iMac).
iPhone screen

'Duncan showing us how, with multi-touch, you could do different things with two fingers and with three fingers' , recalled Satzger. He showed us on-screen rotating and zooming - and I was really surprised that we could do that stuff.'
It was the first time the Apple team had even heard of multi-touch. Today it doesn't seem exceptional, but back then, touch interfaces were pretty primitive. Most touch devices, such as Palm Pilots and Windows tablets, used a pen or stylus.
Screens that were sensitive to fingers, not pens, like ATM screens, were restricted to single presses. There was no pinching or zooming, no swiping up and down or left and right.
Duncan Kerr explained to his colleagues that the new technology would allow people to use two or three fingers instead of just one, and that it would afford much more sophisticated interfaces than simple single-finger button presses.

Jonathan Ive believed the iPhone would be all about the screen. The designers agreed that nothing should detract from the screen, which Jony likened to an 'infinity pool', those high-end swimming pools with an invisible edge.
Jony said they wanted the display to be magical and surprising. These were his high-end goals for any eventual design.

Beyond matters of form, the team focused on the function of the multi-touch. Most touch devices at the time used resistive touch screens, based on two thin sheets of conductive material conductive separated by a thin gap of air.

When the screen is pressed, the two layers make contact, registering the touch. Resistive screens were typically made of plastic, and were common in pen-based devices like Palm Pilots and Apple's Newton.

Jony's design team tried using a resistive screen for the iPhone, but were unsatisfied with the results. Pressing on the screen distorted the picture, and the screen tired the fingers because the user had to press pretty hard.

Moving on from the resistive screen, the hardware team set out to build screens based on capacitive touch, registering changes in electrically charges across its surface. Human skin is electrically conductive, and a capacitive touch-screen uses that characteristic to detect even the lightest touch.
And thanks to this intelligent screen a new era was born.

5K Display

The 27‑inch iMac with Retina 5K display has four times as many pixels as the standard 27‑inch iMac display.
Apple has developed a display with the performance to light up 14.7 million pixels, reducing energy consumption while maintaining our high standard for brightness, and advancing image quality for the most striking contrast ever.

Apple Watch Retina Display

Apple watch display comes in two sizes, 38mm and 42mm. A Retina display is the primary surface for every interaction with Apple Watch. The incredibly high pixel density makes numbers and text easy to read at a glance. Images and graphics render with remarkable sharpness and contrast, including finely detailed ones like the rotation of a hair-thin second hand on a watch face.
Instead of gestures for navigation, it uses a digital crown to handle scrolling and zooming, and a force press to bring up secondary actions.
Furthermore the display is extremely energy efficient, critical for a device you wear throughout the day. On most Apple Watch models, the display is laminated to a machined and polished single crystal

of sapphire. Next to diamond, it's the hardest transparent material. On watches in the Sport collection, protection is provided by strengthened Ion-X glass.

2.5. Processor[34]

Apple during its products' history has changed several types of processors. The last iMac 5K now is the most most powerful iMac yet with a quad-core Intel Core processor available at up to 4.0GHz.

Motorola Processor

The Motorola 68000 was the first Apple Macintosh processor. It had 32-bit CPU registers, a 24-bit address bus, and a 16-bit data path; Motorola referred to it as a "16-/32-bit microprocessor".
It was run by computers such as: Apple Lisa, Macintosh 512K and Macintosh Classic.

The Motorola 68020 was the first 32-bit Mac processor, first used on the Macintosh II. The 68020 had many improvements over the 68000, including an instruction cache; and was the first Mac processor to support a memory management unit, the Motorola 68851.
The Macintosh LC configured the 68020 to use a 16-bit system bus with ASICs that limited RAM to 10 MB (as opposed to the 32-bit limit of 4 GB).

The Motorola 68030 was the first Mac processor with an integrated memory management unit, allowing for virtual memory. Another improvement over the 68020 was the addition of a data cache.
Models like Macintosh IISi, Powerbook series and Powerbook Duo ran it.

[34] In the photo, one of Steve's greatest coups: getting Intel CEO Paul Otellini to walk out on stage at Macworld 2006 in an Intel "bunny suit." That is when Steve announced that Apple was switching its product line over to Intel chips.

The Motorola 68040 had improved per-clock performance compared to the 68030, as well as larger instruction and data caches, and was the first Mac processor with an integrated floating-point unit.
The MC68LC040 version of the microprocessor subtracted the floating-point unit and was less expensive.
The Macintosh Quadra 900 and the Quadra 700 in October 1991 was launched as Apple Computer's first computers using the Motorola 68040 processor.
The Macintosh Centris used the 68LC040 one and 68040 CPUs. Motorola processors are used also for the Powerbook series, as well as the Macintosh LC, running different speeds of the Motorola 68030.

PowerPC Processor

Apple introduced to its products the PowerPC Processor in 1995. PowerPC (an acronym for Performance Optimization With Enhanced RISC, Performance Computing, sometimes abbreviated as PPC) is a RISC instruction set architecture created by the 1991 Apple–IBM–Motorola alliance, known as *AIM*.
The best part of the planning and design was led by Motorola in cooperation with Apple. The name refers to the fourth generation of processors PowerPC developed by Motorola.
IBM was the third partner of the project PowerPC but it didn't take part to the project for the realization of the processor G4, because of differences over the design of computer unit vector integrated into the CPU.

PowerPC, as an evolving instruction set, since 2006 has been named Power ISA, while the old name naturally lives on, as a legacy trademark for some implementations of Power Architecture based processors, and in software package identifiers.
Originally intended for personal computers, PowerPC CPUs have since become popular as embedded and high-performance processors. PowerPC was the cornerstone of AIM's PReP and Common Hardware Reference Platform initiatives in the 1990s and while the architecture is well known for being used by Apple's Power Macintosh, PowerBook, iMac, iBook, and Xserve lines from 1994 to 2006 (before Apple's transition to Intel), its use in video game consoles and embedded applications provided an array of uses. In addition, PowerPC CPUs are still used in AmigaOne and third party AmigaOS 4 personal computers.
PowerPC is largely based on IBM's earlier POWER instruction set architecture, and retains a high level of compatibility with it; the architectures have remained close enough that the same programs and operating systems will run on both if some care is taken in preparation; newer chips in the POWER series implement the full PowerPC instruction set.

PowerPC 601 was used on Power Macintosh, Performa; PowerPC 603 on other next generation of Performa and PowerBook.
Then there are a series of PowerPC improved like PowerPC G3 used for Power Macintosh G3, PowerBook G3, iMac and iBook.

Macintosh computers such as the PowerBook G4 and iBook G4 laptops and the Power Mac G4 and Power Mac G4 Cube desktops all took their name from the processor. PowerPC G4 processors were also used in the eMac, first-generation Xserves, first-generation Mac Minis, and the iMac G4 before the introduction of the PowerPC 970.

PowerPC G4 is a designation used by Apple Computer to describe a fourth generation of 32-bit PowerPC microprocessors.
PowerPC G4 is a microprocessor RISC at 32 bit belogs to the PowerPC processors family.
PowerPC G4 is incorporated in Power Mac G4, PowerBook G4, Power Mac G4 Cube, iMac G4, eMac, iBook G4 and Mac Mini.

Intel Processor

The introduction of the new iMac in 2006 with the iMac Slimmer Intel-Based along with the Intel-based MacBook Pro signaled the start of a six-month transition from PowerPC to Intel processors.

The transition from the use of PowerPC microprocessors supplied by Freescale (formerly Motorola) and IBM in its Macintosh computers, to processors designed and manufactured by Intel, a chief supplier for most of Apple's competitors.

The reasons of the transition [35]

When Apple made the watershed announcement in June 2005 ending its longstanding relationship with IBM and Motorola, Apple CEO Steve Jobs attributed the switch to a superior Intel roadmap. "Looking ahead Intel has the strongest processor roadmap by far," Jobs said in a statement at the time. "It's been ten years since our transition to the PowerPC, and we think Intel's technology will help us create the best personal computers for the next ten years."

[35] Source: Brooke Crothers, “Four years later: Why did Apple drop PowerPC?” (June, 2009)
http://www.cnet.com/news/four-years-later-why-did-apple-drop-powerpc/

- One oft-cited reason was that Apple didn't believe it could get the requisite performance per watt from processors being supplied by IBM and Freescale, formerly Motorola's chipmaking arm. Apple was worried about IBM's and Motorola's ability to deliver competitive processors for laptops;
- Another reason could be that Apple simply wanted to be able to run Windows;
- But there is another explanation that could be given. Apple was paying a premium for IBM silicon, creating a Catch-22. IBM had to charge more because it didn't have the economies of scale of Intel, but Apple didn't want to pay more, even though it supposedly derived more from an inherently superior RISC design as manifested in the PowerPC architecture.

Here's what Jobs said in 2003: "The PowerPC G5 changes all the rules. This 64-bit race car is the heart of our new Power Mac G5, now the world's fastest desktop computer," Jobs said in a statement. "IBM offers the most advanced processor design and manufacturing expertise on earth, and this is just the beginning of a long and productive relationship."

For IBM, the business with Apple was a financial sinkhole because the company had to invest a lot of money in chipsets, compilers, and other supporting technologies but could only take a small percentage of the overall PC processor market. So, in the end, it was impossible to make money.

Apple mobile application processors

Apple Inc. has developed a range of "System on Chip" (SoC) as well as "System in Package" (SiP) mobile application processors to power their mobile consumer devices. In order to meet the stringent power and space constraints common to mobile devices, these chips combine a central processing unit (CPU) with other components into a single compact physical package.

Originally, Apple provided no information regarding the processor and other internal components of the original iPhone, the iPhone 3G, or the iPhone 3GS.
For the iPhone 4, Apple originally mentioned that the device was powered by its own A4 processor of an unspecified clock speed, and still does in some marketing materials, but the company later apparently scrubbed the processor information altogether from official technical specs.
For the iPhone 4S, Apple mentions that it is a "dual core" A5 processor of unspecified speed in the press release, but not elsewhere in technical information. For the iPhone 5, the company press release heralds a "blazing fast A6 chip."
For the iPhone 5c and the iPhone 5s, Apple's dual press releases reveal "blazing fast performance of the A6 chip" and an all new 64-bit "A7 chip" as well as a new "M7 motion coprocessor," for the two devices respectively, but no other details are provided.

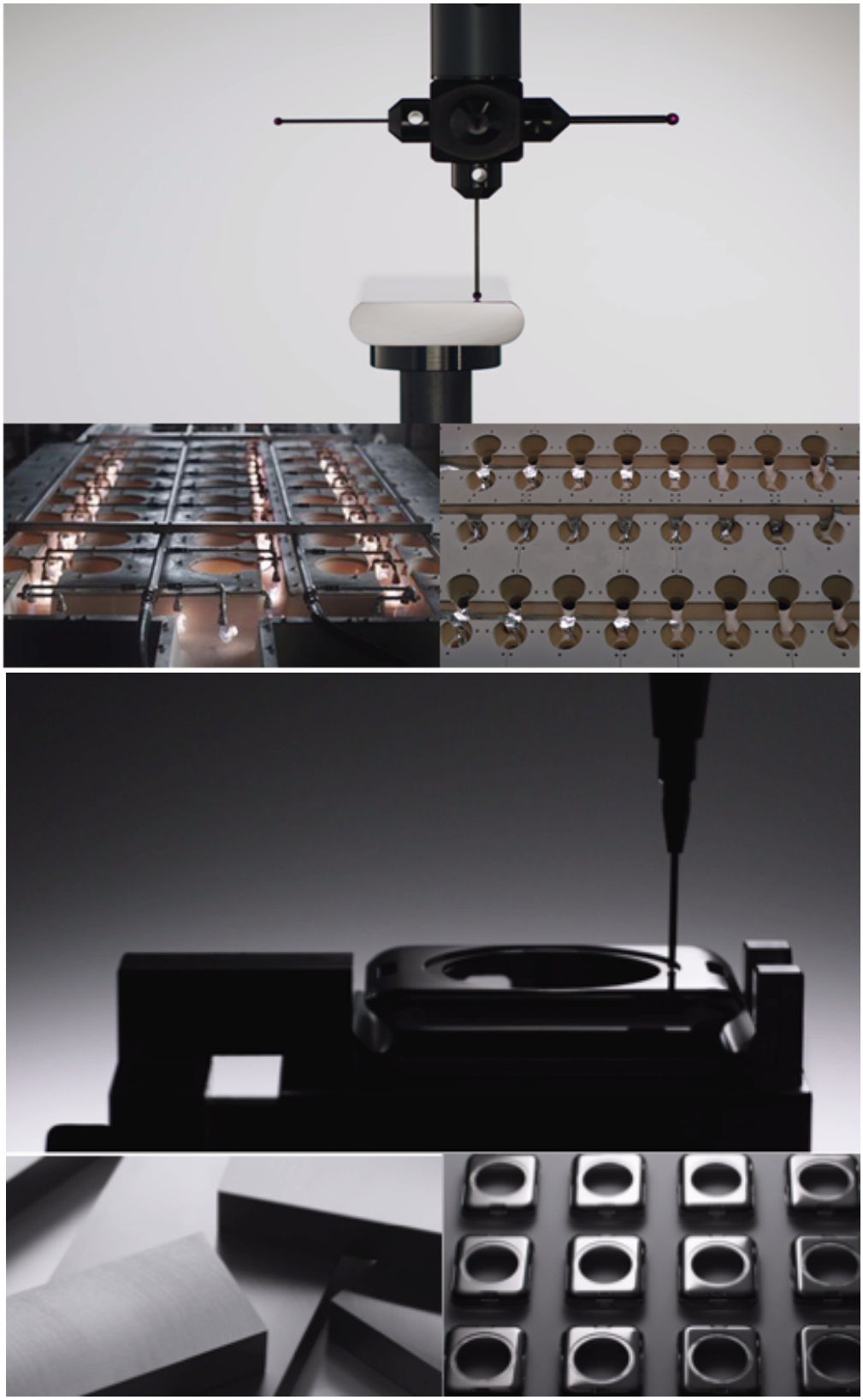
For the iPhone 6 and iPhone 6 Plus, Apple's press release boasts that the devices have an "Apple-designed A8 chip with second generation 64-bit desktop-class architecture for blazing fast performance and power efficiency."
Finally, for the iPhone 6s and iPhone 6s Plus, Apple's press release promises that these models have "Apple's third-generation 64-bit" A9 processor that is "70 percent faster" than the A8 processor before it.
Third-Party Processor Sleuthing

When the original iPhone shipped on June 29, 2007 iFixit disassembled it and learned that the primary processor is an Apple branded Samsung ARM 11 processor running at 412 MHz. Although there was some later speculation that the primary processor might have been provided by Marvell instead of Samsung, Marvell made the chip for 802.11b/g wireless networking, but not the primary processor.
For the iPhone 3G, iFixit and TechOnline collaborated to not only disassemble the device and confirm that like the original it also is powered by an Apple branded Samsung ARM 11 processor running at 412 MHz, but to go a step further and identify and label an exhaustive number of chips used in the iPhone.
Third-party teardowns from iFixit and RapidRepair, as well as an analysis from AnandTech, revealed that the iPhone 3GS has a significantly faster 600 MHz Samsung ARM Cortex A8 processor and a PowerVR SGX graphics processor.
For the iPhone 4 models, disassembly did not provide any precise details regarding the clock speed of the Apple-branded "A4" processor.
However, it was determined that the iPhone 4 is powered by a 1 GHz A4 processor (S5L8930) of variable clock speed that typically runs around 750 MHz to 800 MHz.
The Geekbench benchmark pinpoints that the iPhone 4S uses the "Apple A5" processor like the iPad 2 models, but more specifically it uses a 1 GHz dual-core Apple A5 (S5L8940) processor of variable clock speed, commonly "down clocked" to 800 MHz to conserve battery life.
For the iPhone 5 models, AnandTech determined that it has a custom dual core processor and a three core graphics processor, most likely a 266 MHz PowerVR SGX 543MP3. The Geekbench benchmark confirmed that the iPhone 5c uses the exact same processor as the iPhone 5.
For the iPhone 5s, AnandTech was first to determine that the Apple A7 processor is a ARMv8 derivative of Apple's "Swift" dual core architecture called "Cyclone" and it runs at 1.3 GHz. It also is 28 nm, has a 64k/64k level 1 (instruction/data) cache and a 1 MB level 2 cache.
For the iPhone 6 and iPhone 6 Plus, in a detailed hands-on technical analysis, Chipworks determined that the "Apple-designed" A8 formally is a 20 nm APL1011 processor manufactured by TSMC. It has dual cores and runs around 1.4 GHz.

Finally, for the iPhone 6s and iPhone 6s Plus, third-party analysis from Chipworks determined that there actually are two different "A9" processors used in these models. Some have a 14 nm Samsung-produced APL0898 processor and others have a 16 nm TSMC-produced APL1022 processor with slight variation in heat and battery life. Both have dual cores and run around 1.8 GHz.[36]

[36] http://www.everymac.com/systems/apple/iphone/iphone-faq/iphone-processor-types.html

2.6. Manufacturing Process



'From a design and engineering point of view
Apple is at the absolute pinnacle
of creating products
that are as close to flawless as can be done'

- Dennis Boyle, Co-founder, IDEO -

The manufacturing process is extremely relevant in Apple company, because the innovation comes along with it. Not only the innovation comes from within manufacturing process but also the design. During the first period of Apple without the presence of Jonathan Ive the all-in-one design dominated almost all products from 1995 on. When Ive joined the company he favoured the change from titanium to aluminium, designing some of all the most successful products using this different material. Furthermore he introduced the Unibody Manufacturing Process. The experience led to stunning outcomes, as we will show later in this paragraph.

2.6.1 All-in-one design

The Macintosh LC 500 series, Centris, Quadra, Classic II and Colour Classic models are all computers that shared the same all-in-one desktop case. Even the TAM, although designed by Ive, settled on the almost all-in-one LCD based design.

Borrowing from the 1997 TAM, the various LCD-based iMac ’98 designs continued the all-in-one concept first envisioned in Apple’s original Macintosh computer.
The iMac G5 and the iMac Intel Core Duo feature the same all-in-one design.

2.6.2. Aluminium

The iSight is one of the first Apple products to use aluminium as it primary housing material. The PowerBook G4 was the first to do so in early 2003 and then the iSight and Power Mac G5 followed suit later that year.
The construction methodology is actually quite similar to the iPod mini and this was probably a crucial learning moment that enabled Apple to produce so many iPod minis.
What it is interesting is how iSight has been manufactured: the aluminium housing is a completely seamless tube; a large majority of the product is covered in perforation.
It is simple achieving just one of these, but doing both simultaneously is not. Apple has extruded the tube and then added the perforation as a secondary process. It seems rather unbelievable considering the amount of time it would take to perform the latter.
The Power Mac G5 and the subsequent Mac Pros had a similar aesthetic but they were relatively simple in comparison to manufacture: the holes could be punched out of an aluminium sheet and then bent.

Customization

With the Mac Pro, Apple decided to do something different in terms of configuration. Since the majority of Apple's professional customers tended to heavily-customize their Macs at purchase time, Apple offered a single, heavily customizable Mac Pro model. In effect, this shifted the decision-making for what configurations to sell to the resellers, leaving Apple with a streamlined manufacturing process.

Mac Pro Today

The Mac Pro (2013) is a powerhouse in an astonishingly small and compact chassis, with a design that embraces innovations in manufacturing, cooling technology, and embodies concepts that may very well shape the future of the desktop PC.

The new ultra-minimalist design is a stark departure from the large silvery aluminium tower of the old Mac Pro, like the Apple Mac Pro (Xeon E5620). The new Pro still features an all-aluminium chassis, but that's likely the only similarity between the old and new.

The new Mac Pro is small and compact, a 10-inch tall cylinder (measuring 9.9-inches tall and 6.6-inches in diameter) that gleams and glistens like an artifact out of time, a piece of the future that's come to reside on your desk. We've reviewed other smaller desktops, like the Dell Precision T1700 SFF or the Falcon Northwest Fragbox (GeForce GTX 780 SLI), which put high-performance components into compact chassis designs, but the Mac Pro is in a class apart. The chassis is aluminium, inside and out, and it's dense, weighing 10.93 pounds. Between the sheer weight and the density of components inside, it's a lot heavier than it looks, but that weight only drives home the premium feel.

Though it appears to be burnished black in photos, it's more apt to call it a dark metallic grey, cthe name of the color is "Space Grey", almost a cross between glossy black obsidian and polished chrome. The result most resembles polished hematite, and the glossy surfaces pick up reflections from everything around it.

From the first unveiling to the subsequent ads and private briefings, Apple has pushed the idea that this is the design of the future.
But central to this sleek new look is a design that rests on two main concepts: a design built around Apple's Unified Thermal Core, and a paradigm that emphasizes expansion rather than upgrades. Let's look at each.

The first concept is Apple's new Unified Thermal Core, a design that leverages both materials and design for cooling the hot components that fit inside this gallon-sized desktop. Inside, all of the Mac Pro's components are mounted onto a triangular aluminium frame. Extruded as a single piece of metal and then milled to exacting specifications, the inner frame serves as the primary heat sink for the processor and graphics. The three-sided design has one board covered in ports, with two more on the other sides of the triangle. Inside, the empty space has its cooling capabilities enhanced further with heat-dissipating vanes. Sitting on top of the whole thing is an exhaust fan, designed to pull air up from intakes on the bottom of the case, up through the components and cooling vanes, and then through the fan, which pumps the now hot air out through the top.

The second concept is one of peripherals over upgrades (Expansion, Not Upgrades). Apple's new paradigm does away with the easily accessible drive bays and swappable graphics cards of the previous models, like the Apple Mac Pro (Xeon E5620) from 2010, in favor of an external, modular approach. While you can still open up the case without having to reach for a screwdriver, you'll find far less opportunity inside for maintenance and upgrades. But that's not to say that it's entirely closed to the user; slide off the exterior shell of the chassis and you'll find access to four DIMM slots for RAM, as well as access to the internal PCIe-based flash storage. As for the processor or either of the graphics cards, both are tucked further inside, out of reach.

Upgrades, in the sense that connecting external storage or peripherals is an upgrade, are all done through the rear port selection. The primary feature on the otherwise blank exterior of the Mac Pro is the rear panel, which lights up for easy visibility whenever the tower shifts from its stationary position. On this panel, you'll find four USB 3.0 ports and six Thunderbolt 2.0 ports, along with two Gigabit Ethernet ports, an HDMI port, and jacks for headphone and audio line out.

While this lack of internal access and traditional expansion is significantly different from the standard workstation desktop, it is in keeping with Apple's overall approach in recent years. Looking at the Apple iMac 27-inch (Nvidia GeForce GTX 675M), for example, there's actually less opportunity for expansion, only providing access to RAM, and offering only two Thunderbolt ports for modular expansion.

2.6.3. From Plastic to Glass

While Apple's operations group was working out how to manufacture the iPhone, Jony's design team was having doubts about their original choice of material for the screen.

Jony and his team planned to use plastic, mostly because it was shatterproof. Although all of the iPhone prototypes had plastic screens, the designers were never happy with it.

In a gusty next move, they decided to try glass, despite the facts that glass breaks easily and no one had made a consumer electronic device with such a big piece of glass.

' I won't sell a product that gets scratched, ' Jobs said later. ' I want a glass screen, and I want it perfect in six weeks. '

Apple operations group was charged with finding the strongest glass available. The search led them to Corning Incorporated, a glass manufacturer headquartered in upstate New York.

In 1960, Corning had created an early unbreakable reinforced glass they called 'muscled glass' or Chemcor. The key to its manufacture was an innovative chemical process in which glass is deeped into

a hot bath of potassium salt. Smaller sodium atoms leave the glass, and are replaced by bigger potassium atoms from the salt. This process make the glass exceptional damage resistant.

When Apple's operations group came calling in 2006, they found Corning had been thinking about bringing back the old superglass for a couple of years.
The company completely remade its manufacturing processes, based in Kentucky, changing several of its LCD-making plants to muscled glass, by then renamed Gorilla Glass. In May 2007, Corning was making thousands of yards of Gorilla Glass.

Corning's glass, in combination with the aluminium back, marked another change in Jony's design language. It was a striking, almost shocking, minimalism in hard metal and glass.
To hold the glass screen in place, Jony's team came up with a shiny stainless steel bezel, which doubled as a structural element. The bezel would give the iPhone strength, but it also needed to look good.

Jony's team worried that the glass would smash if the phone was dropped. ' We were putting glass in close proximity to hardened steel, ' said Satzger, who pointed out that, ' if you drop [the phone], you don't have to worry about the ground hitting the glass. You have to worry about the band of steel surrounding the glass hitting the glass. '
The solution was a thin rubber gasket between the glass screen and the stainless steel bezel.

2.6.4. Unibody Manufacturing Process

In 2008, Jony took the stage at an Apple event to talk about something special: Apple's new Unibody Manufacturing Process. His very appearance was a clear sign from the company of the importance of this design breakthrough.

Jony began by talking about the old Macbook Pro, which was one of the lightest and strongest laptops on the market at the time. It's robust strenght resulted from a complex structure of internal frames and strenghtning plates screwed and welded together. As Jony spoke, a series of slides played behind him, showing the multiple parts layered, bonded and finally mated with a plastic gasket that run around the middle.

'For years, 'Jony told the audience, 'we have been looking for a better way to make a notebook. 'He paused and smiled before continuing. 'And we think we found it.'

Jony went on to explain the manufacture of MacBook Air, Apple's new razor-thin laptop.

Instead of talking multiple sheets of metal and layering them, the new process began with a thick block of metal and in a reversal of the old process, produced a frame by removing material rather than by adding it.

Multiple parts were replaced by just one, hence the name unibody.[37]

At that moment, the MacBook Air was the only Apple machine made with the unibody process. However, Apple was about to move almost all of its major products, including the Mac, iPhone and iPad, to unibody.

[37] Jonathan Ive explaining the Unibody Design: 'The MacBook Pro family really is a quite remarkable engineering achievement. It's truly the result of years of hard work and innovation and it's driven by the obsessive attention to every detail, and this is particular evident in the enclosure. Traditionally notebooks are made from multiple parts. But the problem is that when you have multiple parts you have size on weight and you increase your opportunity for failure. And the huge breakthrough that we had was to replace all of those parts with just one part. And that one part we called Unibody. We figured out a way of being able to make the notebook fundamentally thinner, lighter, more robust. And the only way to make that one part was to machine from a single piece of aluminium. In many ways I think it's more beautiful internally than it is externally.' Apple special event video, October 2014.

As part of his characteristic drive to reduce and simplify, Jony wanted to reduce the number of parts and therefore the number of part-to-part joints. Previously, when IDg had done a similar dismantling of an original iPhone the team counted nearly thirty interfaces where parts meet. After the iPhone underwent a unibody makeover, the number of interfaces shrank to just five.

Jony's slides illustrated the various stages. He said, while smiling 'One of the fantastic things about aluminium is how recyclable it is. So at each of these distinct stages, we are continually collecting the material, and cleaning it and then recycling it.'

In 2005 Jony and the team visited various watch manufacturers to see how precise, long-lasting time-keeping products were made.
'We started researching watch companies just to understand machining metals, finishing metals, product assembly, ' recalled Satzger.
What they found was a remarkably high standard of manufacturing. Most importantly, they relaized the watch industry used highly machined parts in their high-end products.
While the solution made sense, the Apple investigators also learned that watched are made in relatively small batches.

The Unibody Manufacturing Process is a blanket name for a number of machining operations. Machining in general as long been time-and labour-intensive.

Traditionally, machining as rarely been used in mass production, which is more likely to rely on fast and efficient methods like stamping and moulding to turn out products in the millions. Machining is usually associated with one-shot products or small batches.

In industry, machining has usually been employed only by specialized manufacturers with high standards such as aerospace, defence, high-end watches and designer cars, like the Aston Martin. It is the way to make the best parts possible, the pinnacle of refinement and precision. But it takes time and money.

As Dennis Boyle, Co-founder, IDEO said 'Apple has proved that if a company invests at the highest level and takes Ive and his team's designs and really sticks to them without compromising on how they look and feel, then it can create products that are so sought after, so beautiful and elegant, that they can make them a success. From a design and engineering point of view, Apple is at the absolute pinnacle of creating products that are as close to flawless as can be done.'

'Machining enables a level of precision that is just completely unheard of in this industry, ' said Jony. ' We have been so fanatical in the tolerances of how we machine and build these products, in many ways I think it is more beautiful internally than it is externally. I think that testifies to just our care, to how much we care. '

Jony saw the Unibody Process as the key to shrinking the iPhone, iPad and MacBook. Unibody allowed Jony's team to make the iPhone 5 about 3 millimetres thinner than the iPhone 4S. It trimmed about 30 per cent of the thickness off an already thin product.
For a laptop body, the first part of the process is to create a block of extruded aluminium from a billet (a big round tube) of raw aluminium.

The billet is put through a giant hot press that, as if making flat noodles from a ball of dough, creates an extrusion into a sheet of aluminium.
The aluminium sheet then begins a trip through thirteen separate milling operations to get it into its final shape. The metal is cut into rectangular blocks the size of the laptop. It goes into the first CNC machine (Computer Numerical Control machine tool), where a laser drill creates a series of registration holes that guide the next cutting operation, a rough 'hogging out' that removes the majority of the unwanted material.
This step is followed by a series of increasingly precise milling operations that create the fineshed part.
The next stage is the laser drilling of perforations for indicator lights. The laser drill is extermely accurated and fast, vaporazing metal with each pulse.

The famous designer Chris Lefteri in an interview said that is a craftman-like approach to the industrial production process.

Apple uses lasers to etch serial numbers and other technical info onto the case, and may use them to inscribe personal inscriptions on the backs of iPods.

After laser drilling, the unibody is passed to a CNC grinding machine that smooths burrs, rough patches and any surface imperfections. The cases are then 'blast finished' - sprayed with dry particulates such as ceramic, silica, glass or metal under high pressure - to give the surfaces a textured, matte finish.
The entire unibody process is very much a trade secret, so Apple reveals few details.

The iPad design marked big advance in manufacturing (with the Unibody Process), which allowed Jony to fashion the deeply bevelled back he originally wanted, but in metal, using Apple's new Unibody Manufacturing Process. ' By reducing what were essentially free surfaces to two, we got rid of the structural wall around the perimeter of the product and eliminated the edge. It's not only more comfortable to hold, but with the breakthrough we made through Unibody Engineering, it's rigid, sturdy and even more precise.'

2.6.4.1. Financial Data

Unibody represents a giant financial gamble by Apple. When it started investing seriously around 2007, Apple contracted with a Japanese manufacturer to buy all the milling machines it could produce for the next three years.

By one estimate, that was 20,000 CNC milling machines a year, some costing upward of $250,000 and others $1 million or more.

The spending didn't stop there, as Apple bought up even more, acquiring every CNC milling machine the company could find.

'They bought up the entire supply,' said one source. 'No one else could get a look in.'

This spending on tooling ramped up with the iPhone and iPad, which relied more on machining with each generation.

According to Horace Dediu of Asymco, an analyst firm, the original iPhone cost $408 million in equipment investment. But by 2012, as the iPhone 5 and iPad 3 (both unibody products) went to production, Apple's capital expenditures ballooned to even more mind-boggling levels.

Apple spent $9.5 billion on capital expenditures, the majority of which was earmarked for product tooling and manufacturing processes.

By comparison, the company spent $865 million on retail stores.

Thus, Apple spent nearly eleven times as much on its factories as on its stores, most of which are in prime real estate locations.

iPhone 5

It required a manufacturing process with precision and at scale never seen before. According to Apple senior vice president of design, Jony Ive, they now measured in microns (A unit of length equal to one thousandth (10^-3) of a millimeter or one millionth (10^-6) of a meter).

Though the overall rounded-rectangle shape of the iPhone 5 stayed the same, Apple rebuilt the casing from the atoms on up. Instead of a glass back and stainless steel band, they went back to the aluminium of the original iPhone. This time, however, they made it a unibody that covered the back and sides and included diamond polished chamfered edges. Ceramic/pigmented glass was still used on the top and bottom for RF transparency, however, resulting in a two-tone effect.

Dark colors, especially black, are incredibly hard to anodize and that did cause some issues for Apple when it came to scratching and chipping.

While gold is the easiest colors to anodize, black remained the hardest. After dealing with scratches and chips on the black and slate gray iPhone 5, Apple switched to black and space gray on the iPhone 5s. It wasn't a big change in terms of shade, but it proved to be a giant leap when it came to resiliency.

iPhone 5c

It had the same 1136x640, 16:9 in-cell display, but it replaced the aluminium casing with polycarbonate. The change did cost Apple slightly when it came to size, adding millimeters around the edges and on the back, but it let them replace the harder-to-manufacture and easier to damage aluminium of the iPhone 5 with the more rugged, hard-coated polycarbonate of the iPhone 5c.

2.6.5. MacBook 2015 Manufacturing Process

Keyboard

From the beginning, the goal was to design a full, uncompromising Mac experience. And a full-size keyboard is an essential part of that. In order to fit a full-size keyboard in the incredibly thin MacBook, Apple has designed the keyboard from the ground up. Each component has been rethought specifically for the new

MacBook, from the underlying mechanism to the curvature of the surface of each key to the distinctive new typeface. The result is a keyboard dramatically thinner than its predecessor.

Butterfly mechanism

Traditional keyboards use a scissor mechanism, which tends to wobble around the edges. This creates a lack of precision when you strike anywhere except the center of the key. It was needed to reduce key wobbling for a keyboard this thin; otherwise, striking a key off-center could result in the keycap hitting bottom before a keystroke registers.

So Apple designed an entirely new butterfly mechanism, which is wider than the scissor mechanism and has a single assembly made from a stiffer material, allowing for a more stable, responsive key that takes up less vertical space. This innovative design improves stability, uniformity, and control.

Key design

The redesigned keys on the new MacBook feature a larger surface area, a thinner construction, and a deeper curvature, creating a more defined space for fingertip to naturally find and press the keys.
Combined with the butterfly mechanism, this new design allows for much greater control when typing (17% larger kyes; 40% thinner key assembly)

Precision backlighting

To deliver the gorgeous Retina experience on the sleek new MacBook, Apple had to innovate on every level, right down to the pixel. So Apple redesigned the pixels to create a larger aperture, allowing more light to pass through. This enabled to use LED backlighting that's 30 percent more energy efficient than the Retina display on any other Mac notebook, yet still achieve the same level of vivid brightness.

The Force Touch trackpad

The new Force Touch trackpad may look like other trackpads on the surface, but underneath it's unlike anything that's existed before. Force sensors detect how much pressure is applied, and the new Taptic Engine provides a click sensation when pressing anywhere on the surface.

Traditional trackpads use a "diving board" mechanism, which requires room underneath for the downward motion of a click and makes it harder to click the part of the surface closest to the keyboard. With the Force Touch trackpad, force sensors detect your click anywhere on the surface and move the trackpad laterally toward you, although the feel is the same familiar downward motion you're accustomed to in a trackpad.

The Taptic Engine also provides haptic feedback, so instead of just seeing what's happening on the screen, you can feel it, too. The trackpad sends a tangible response to your fingertip when you perform certain tasks, like aligning annotations on a PDF.

Fanless architecture

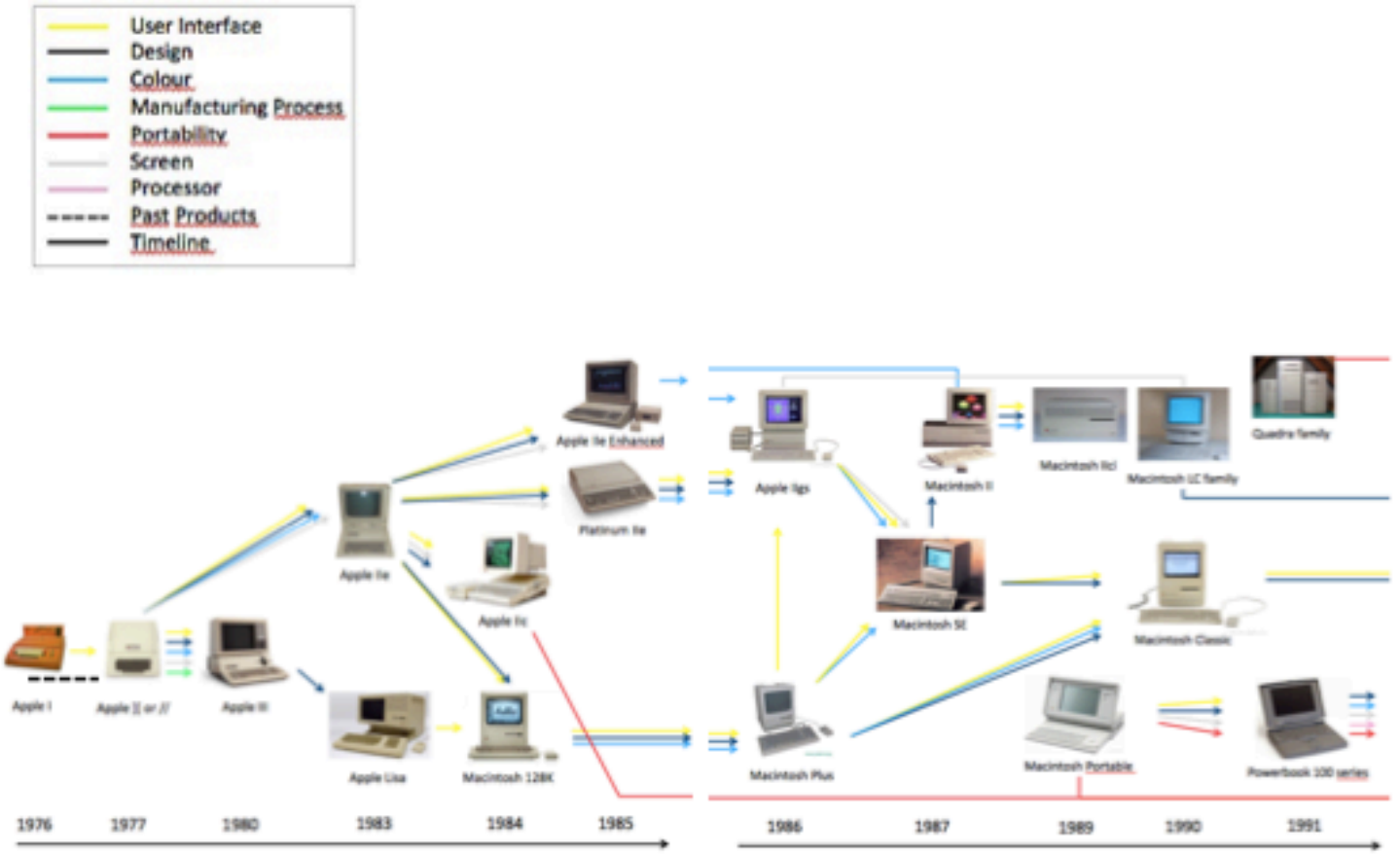
Standard Notebook Batteries

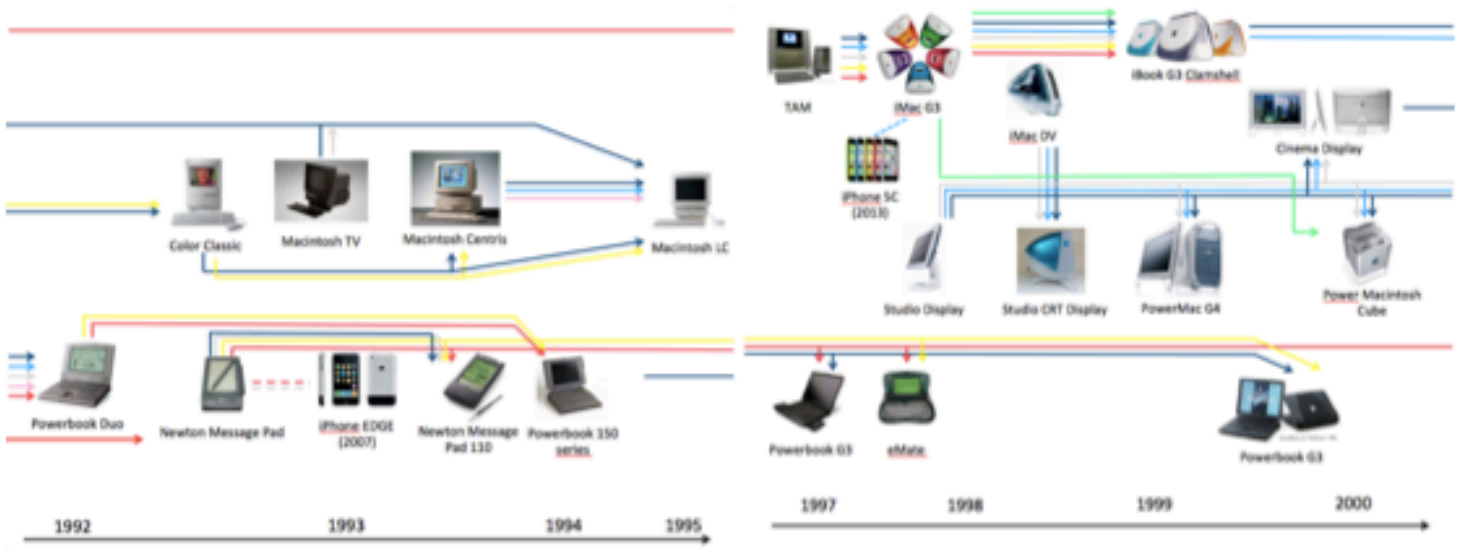
New Macbook Batteries

The new MacBook is the first Mac notebook ever without a fan. Since the Intel Core M chip draws only 5 watts of power and therefore generates less heat, no fan or heat pipe is required. Instead, the logic board is seated on top of an anisotropic graphite sheet, which helps disperse any heat that is generated out to the sides, all while your Mac stays virtually silent. The new MacBook is made

even more efficient by OS X features like Timer Coalescing, App Nap, and Safari Power Saver, which ensure that every task is performed using just the right amount of power. No more, no less.

Apple Products Chart

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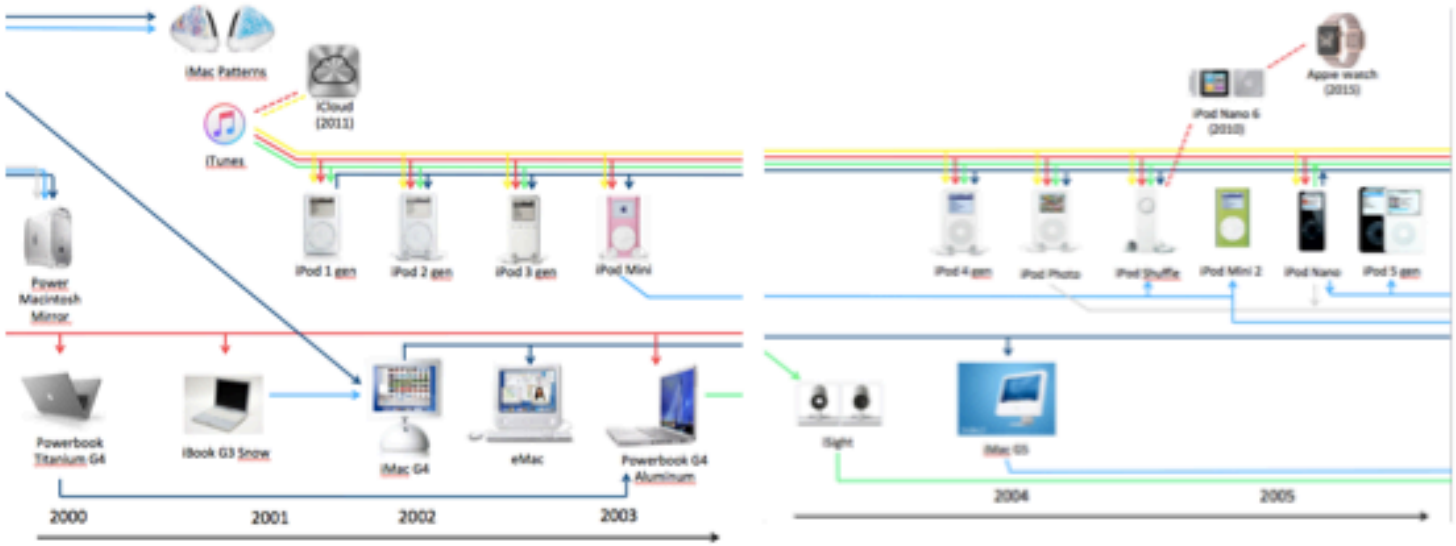
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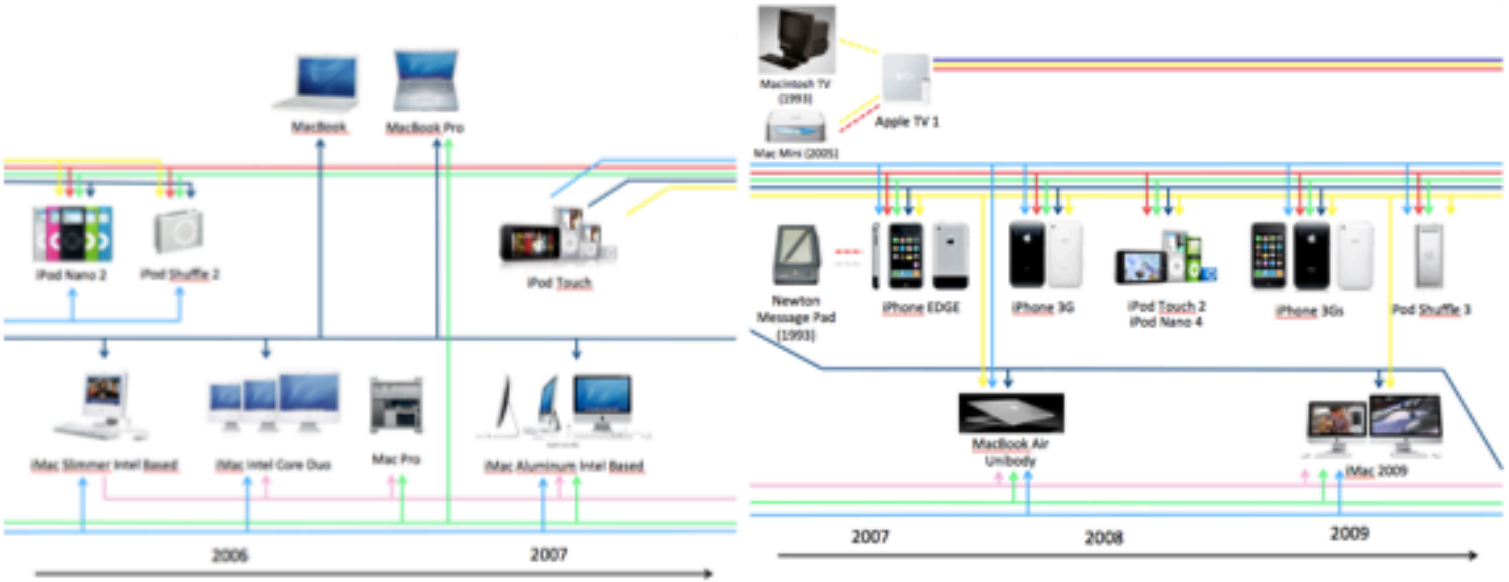
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Mac Pro
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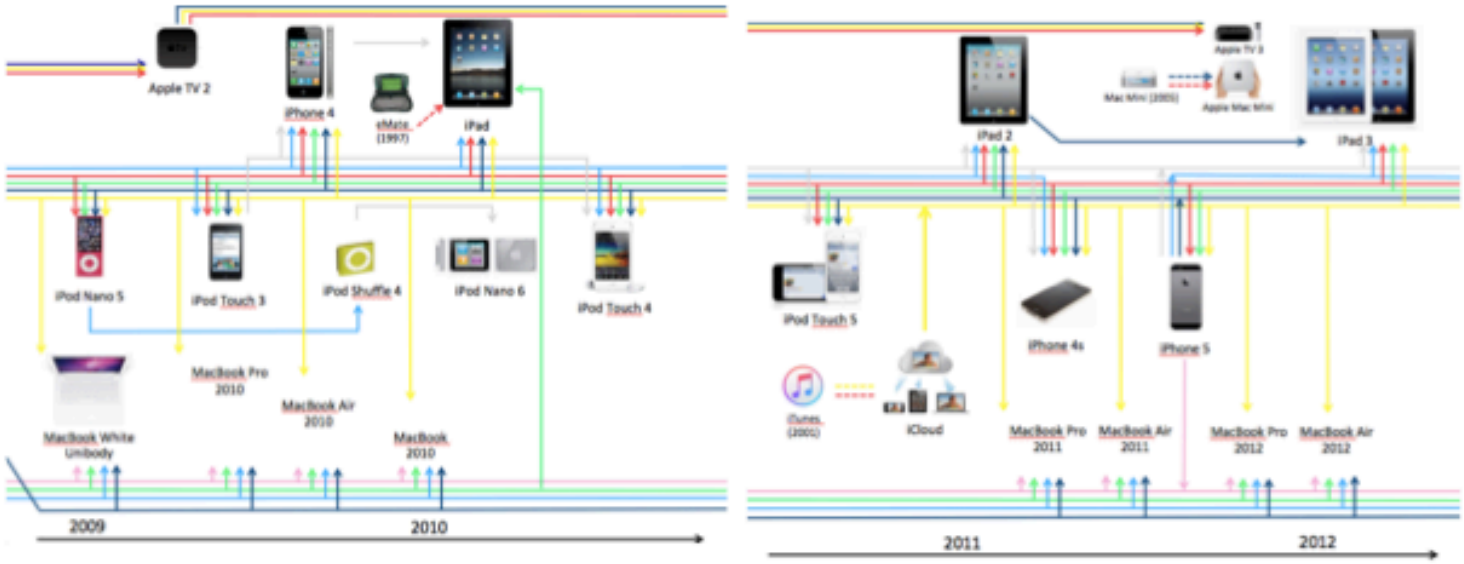
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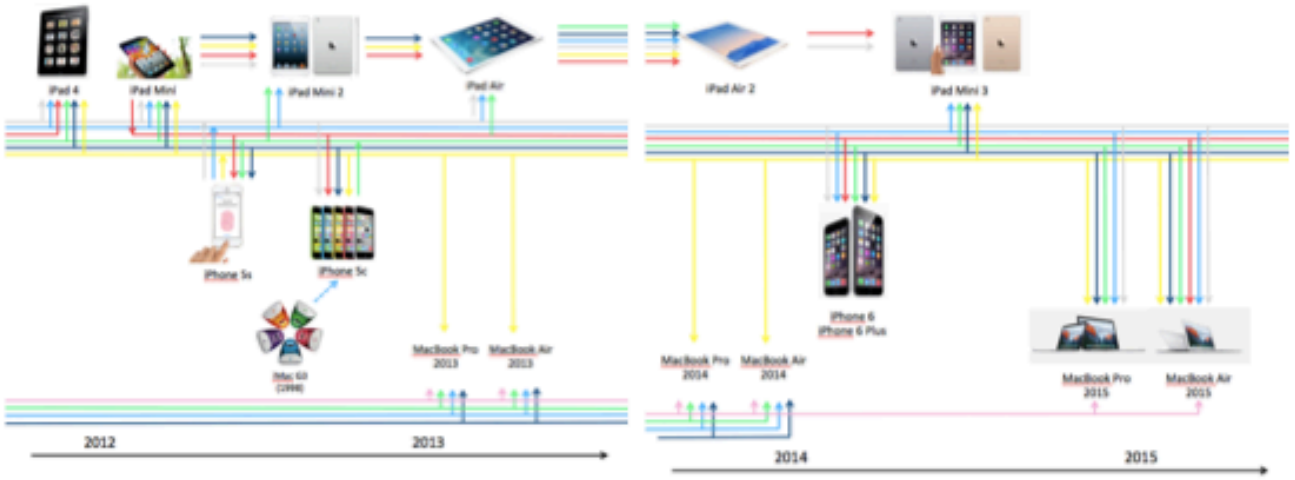
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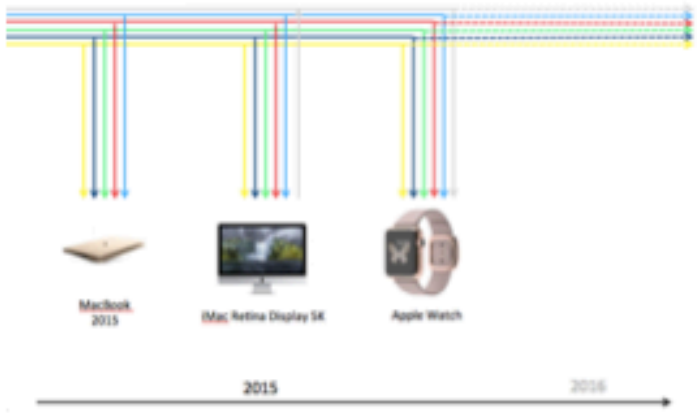

MacBook
2015
iMac Retina Display 5K
Apple Watch
2015
2016

Chapter 3

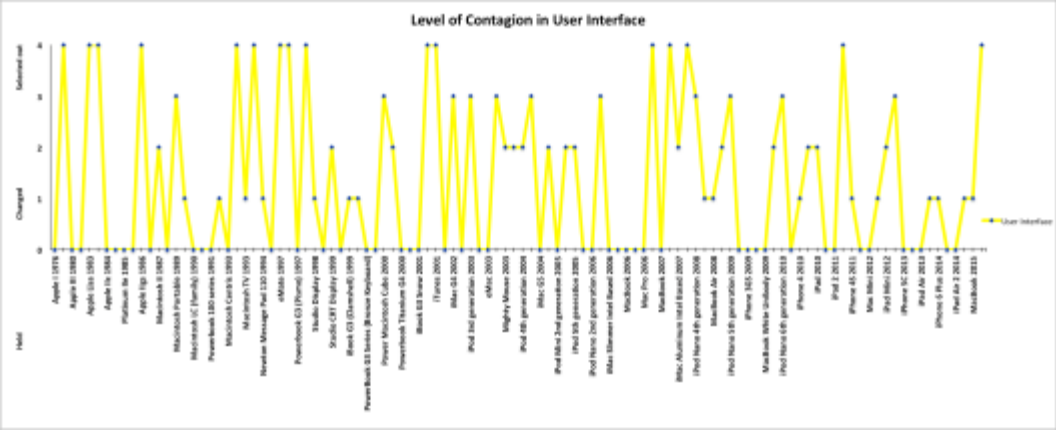
Pivot products and their influence

At the end of this evolutionary analysis from the point of view of each changing element, we could choose along the family tree some products, whose characteristics are disruptive and which are significant for other products in the same timespan. This kind of products will be named for this reason *pivot products*.
Pivot products represents the moment in which there is a break point in the history of the company. Their characteristics are those that change and influence the most.
They give birth to features that will be recurring in other products, so they can be seen as *parents*.
In the first part of this chapter it has been outlined the history of all products and for each of them they have been individuated the parents, who represent the influencing products.

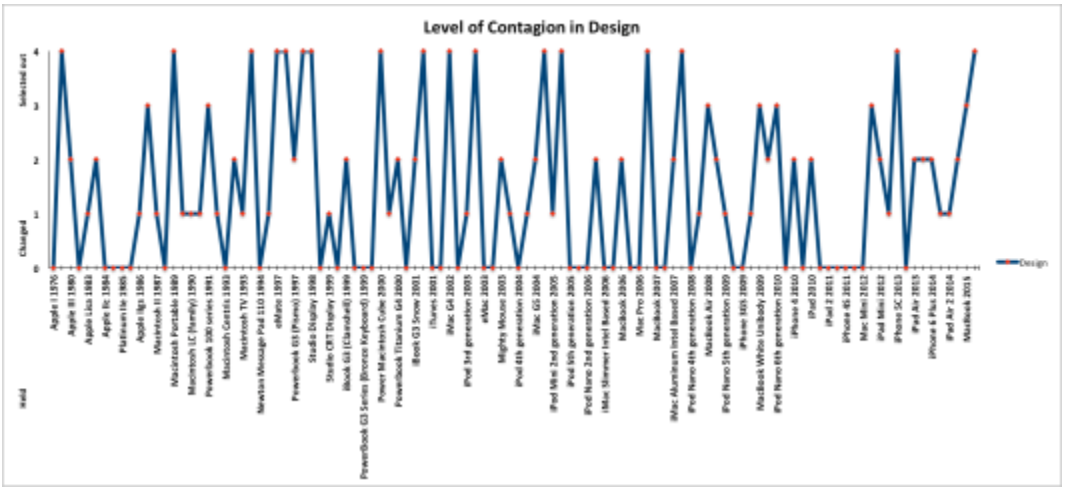
To identify pivot products we have used a quantitative method. For each product it has been assigned a level of contagion for each of the characteristics analysed: user interface, design, colour, portability, screen processor, manufacturing process. Then it has been created a chart reporting the sum of all the levels.

The possible values of this index range from 0 to 4. A high level of contagion (3 or 4) has been assigned to pivot products because of their high influence. Their characteristics are new and they have been selected out, not internally. The influence of these products on others is very high but they are not very much influenced from previous products. They are innovative and disruptive.
If the level of contagion is low, to the product will be assigned 0, and it means that the product's characteristics have not been changed respect to the related pivot product. These products do not influence very much the others but they follow the trend of pivot products' characteristics.
If the characteristics are only modified respect to pivot products, the level will be around 1 or 2, according to the relevance of the alteration.

The following charts show the level of contagion trends for each characteristic.

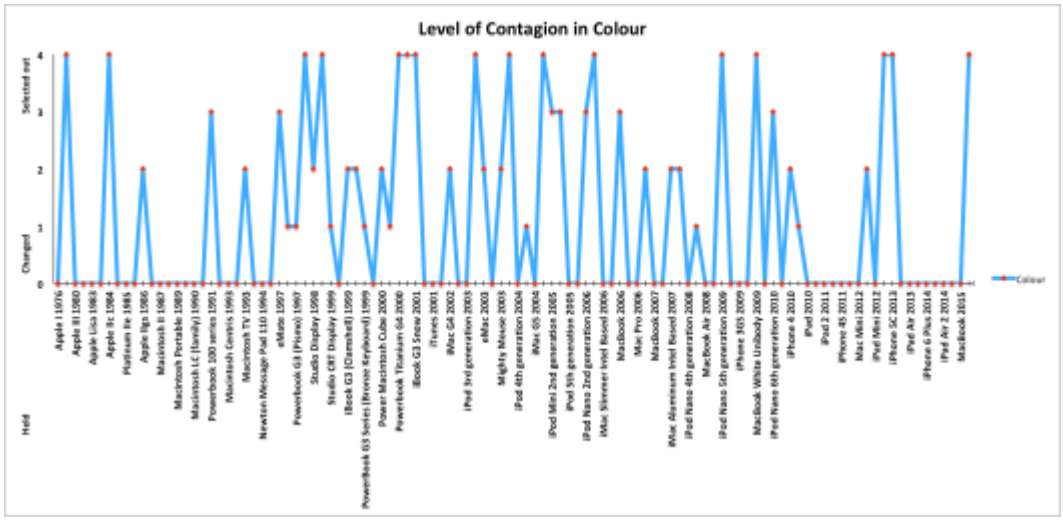


From this trend we can notice many peaks, so we can conclude that the user interface is a key characteristic on which Apple is focused more. Since it was born, this company has always been extremely innovative in this field. It can be considered definitely as one of the key success factors of Apple.



About design we have many pivot products having a strong influence on others. Periods of extreme innovation alternate with stable ones. The trend is equilibrated, except the last one going from 2014 on, in which the design is more and more innovative. We have an increasing trend and always more disruptive products. Products are very different and the design is not brought by others but from new and innovative ideas.

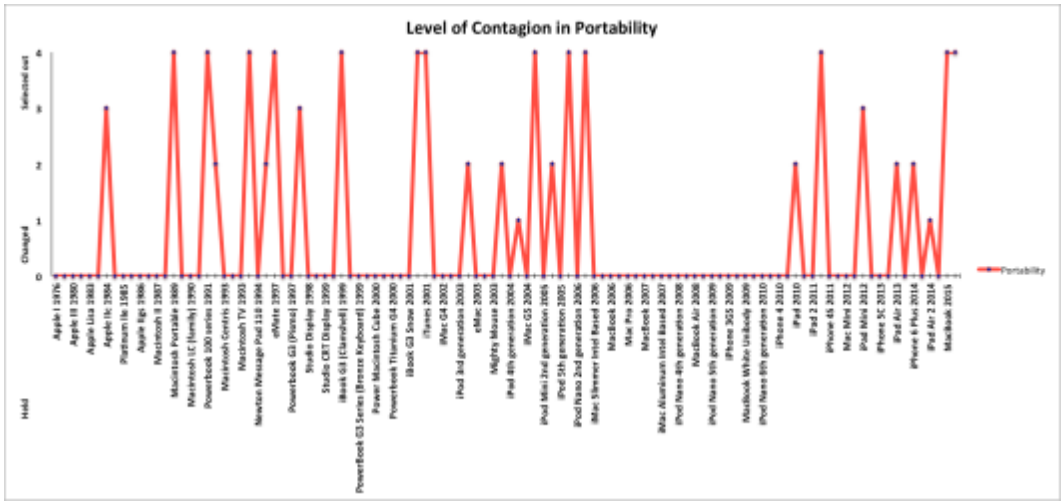
This communicates a tendency to innovate the design more quickly and frequently respect to previous periods.



From the point of view of colour, the trend is quite similar to design's one, with some few differences. Until the end of the last century, colour in Apple products changed very frequently, having some peaks for instance around 1998, with the iMac. This is a product which have influenced an entire era with its innovative colours not only for Apple but also for others companies working in the same field and not. The colour is obviously influenced by the material so we have similar trends in manufacturing process, with the changing from titanium to aluminium for instance.

The last period, going from the iPhone EDGE launch on, is characterised by a strong influence of this product to following ones. The colours do not change significantly and they are used for both following iPhones and other products. Until the introduction of a new colour coming with the iPhone 5s: gold. This has influenced best part of the products until now. Together with iPhone 5s, the most colourful iPhone was launched, iPhone 5c. In 2015 with the Apple Watch we have a drastic change in colours, becoming possible to customize the straps to wear.

We can deduce that Apple recently has focused more on specific kinds of colours, trying to give a recognizable footprint and creating the concept of both elegant and smart devices.

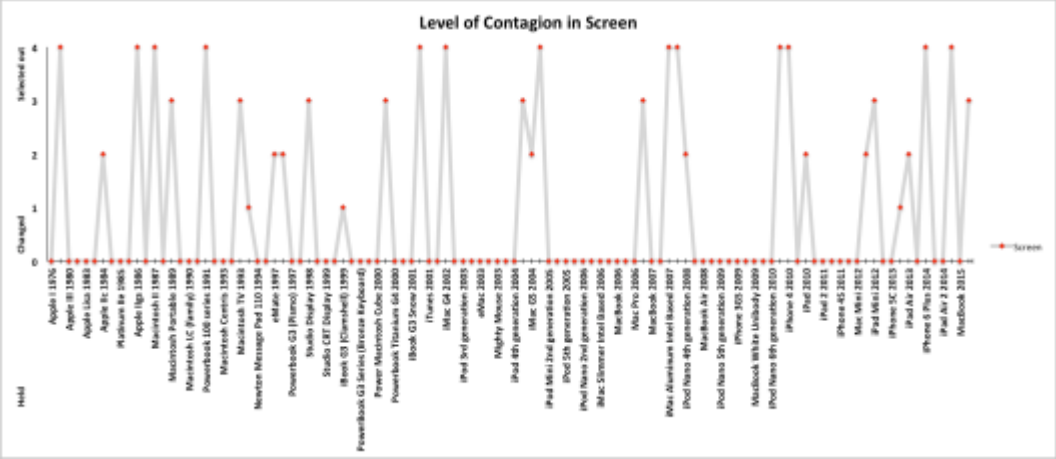


Studying the portability trend is interesting because it outlines the evolution of technologies' use and customers needs, beyond the portability itself.

From 1989 with the Macintosh Portable there is the first step toward the concept of portability. The contagion through the years is very high because it will come back with the PowerBook series, the Newton Message Pad and eMate. A disruptive point in portability trend is given by iPod generation who gives birth to the concept of bring music everywhere. There are no relevant changes until this concept will be strengthened with the launch of the iPad, a thinner and lighter device. Its characteristics make it more transportable, versatile and adaptable. It introduced the world to thousands of new ways to use a computer.

iCloud represents a peak in portability trend, because it allows to have contents available everywhere, even without carrying a device.

Presumably in the long run portability will be more and more relevant. The growing importance given to the portability is proved also from the latest Apple's choice: introduce its own wereable technology: Apple Watch.

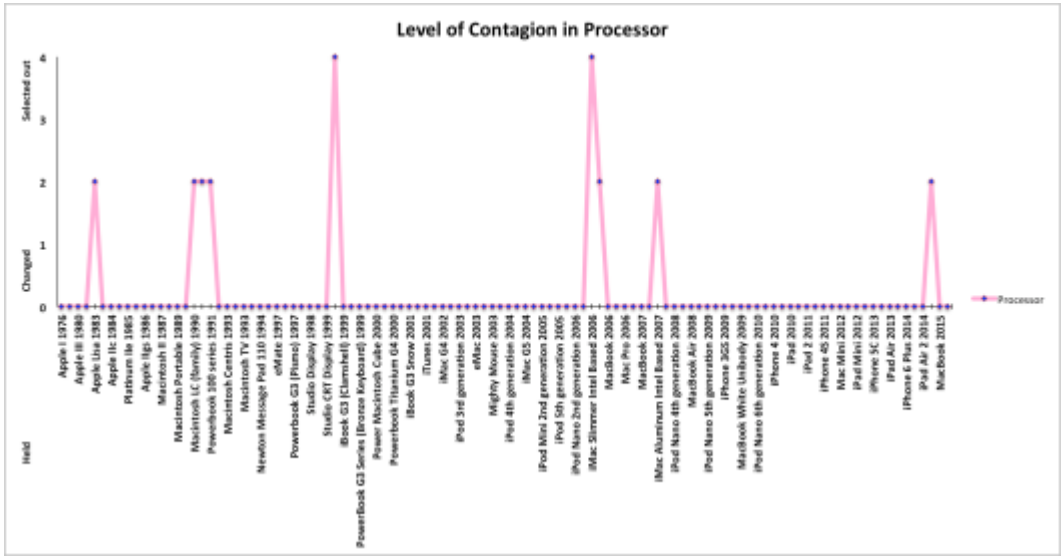


Analysing the trend of level of contagion in screen, we notice that it is influenced by the presence of products such as the iPhone EDGE. It represents the introduction of a new way to use the screen, with an "accessory always kept on hand": fingers.

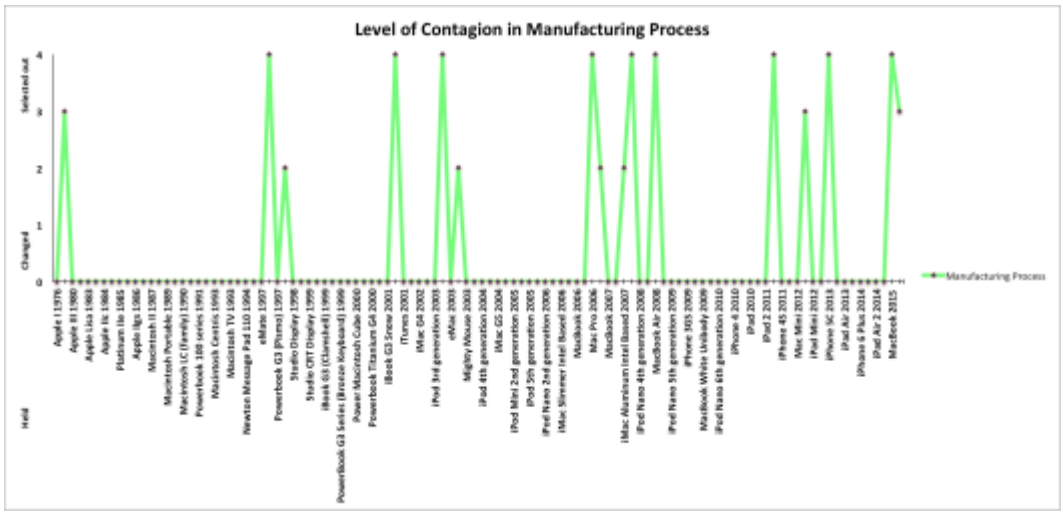
In the same year, since the transition to the Aluminum models, Apple removed the matte, anti-glare screen as on option for its Cinema Displays. As a consequence, the Cinema Displays have been available from Apple only with a glossy screen. Apple removed the matte screen option from its line of iMac desktop computers on August 7, 2007, so Apple does not offer any desktop equipment with a matte, anti-glare screen.

With the iPad Mini the screen has been modified to rest in a "hand and a half".

Retina Display, appearing firstly in 2010 on iPhone 4, marks another break point. It is present in all the products from this moment on, in 4K and 5K version with the iMac with Retina Display 5K Display.



Processors has been changed, modified and enhanced during Apple products' history. There are two relevant turning points: the transition from Motorola to PowerPC Processor with the fourth generation (G4) and the most important transition to Intel Processor in 2006 with the iMac Slimmer Intel Based. The last iMac 5K now is the most most powerful iMac yet with a quad-core Intel Core processor available at up to 4.0GHz.



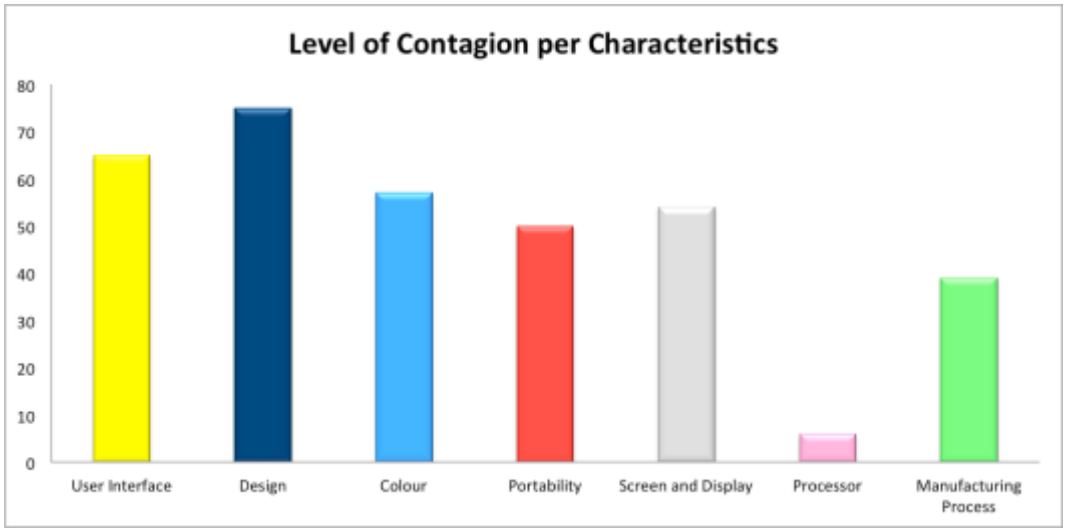
Manufacturing process trend is dominated by some products that changed dramatically the way of creating and the materials. Apple II introduced the all-in-one design, held for a long period until the introduction of a new material: the aluminium. The PowerBook G4 was one of the first computers to use it. It influenced best part of all the following products such as the iSight, PowerMac G5.

With the Mac Pro was introduced Unified Thermal Core, a design that leverages both materials and design for cooling the hot components.

The project of the iPhone surely shocked the manufacturing process, due to the totally new device to create, changing the plastic with the glass.
The first iPhone built in aluminium is the iPhone 5. And it was the first to be built using the Unibody Manufacturing Process, introduced by Sir Jonathan Ive. This kind of MP is used also for the newest MacBook, which has been indicated as a disruptive point because it has introduced new characteristics never seen before, such as the Fanless architecture, Butterfly Mechanism and the Force Touch trackpad.

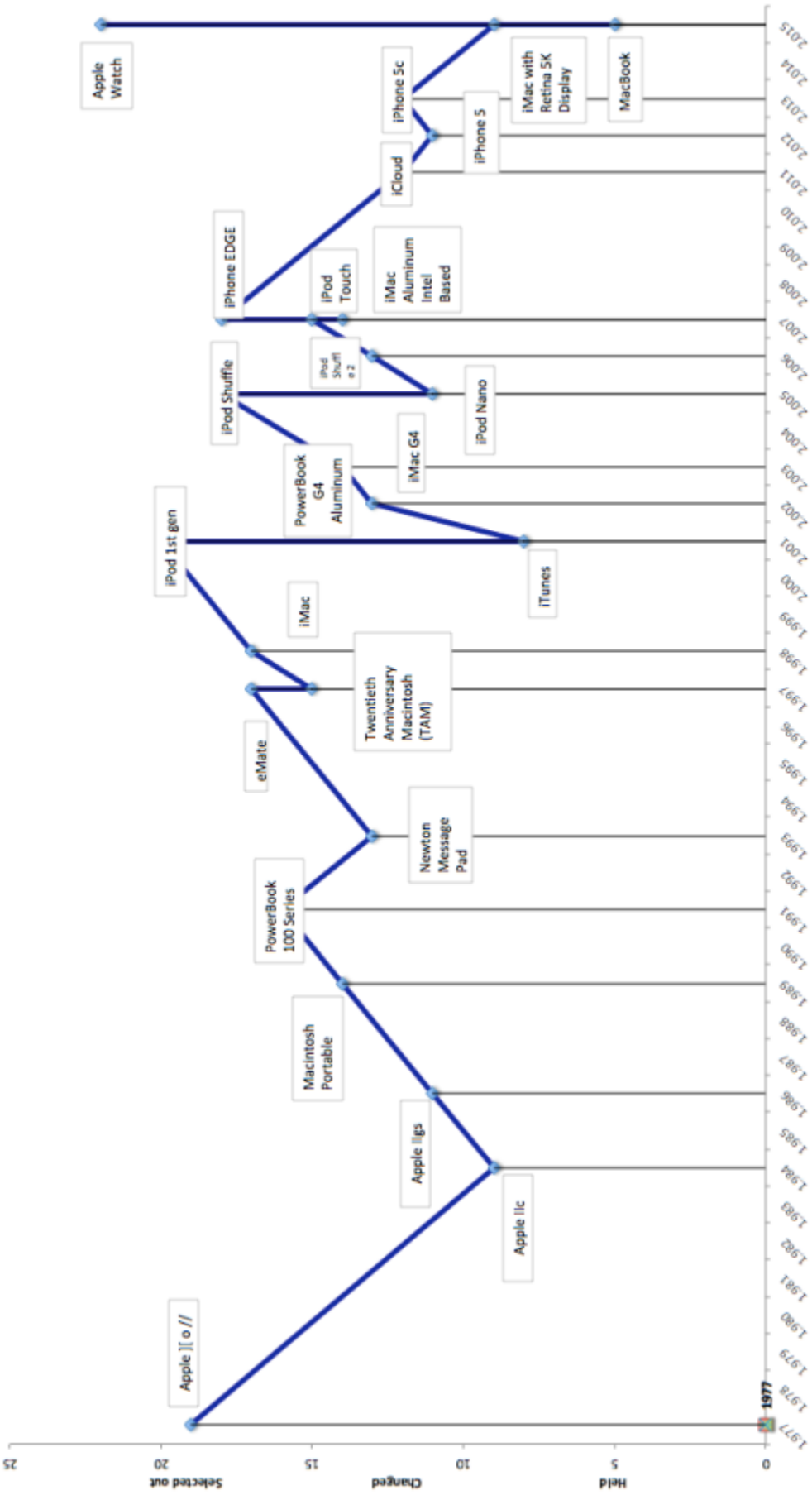
In the following chart they have been represented on X axis all the products analysed and on Y axis it has been indicated their respectively total level of contagion of all the characteristics.

As we can see by the chart there are some peaks, in which the level of contagion is very high. They represent the pivot products.



The characteristic which has influenced the most the strategy of Apple is the design, followed by UI. In fact they are the most peculiar traits on which Apple has been focused since it was born. The colour mostly follows the design. It changes dramatically overtime but it is quite stable and not so variable as the design and UI. The less relevant characteristic, from the point of view of level of contagion, is the processor. It has changed during the history but only few times. The portability factor is quite significant. It is characterised by breaking points and it is variable. This characteristic in my opinion will be always more variable, transforming again the hi-tech industry and changing again the way to use devices. My forecast is that this characteristic will be more and more innovative and disruptive, so much to overcome design.

To have a tangible outcome and simplify the analysis we can put only pivot products on a different clearer graph, which will help to identify visually the prevailing and dominant choices during the years. This will allow answering to the research question: how did Apple strategy evolve overtime?


Apple Watch
iPhone 5c
iPhone 5
iMac with Retina 5K Display
MacBook
iCloud
iPhone EDGE
iPod Touch
iMac Aluminum Intel Based
iPod Shuffle
iPod Nano
PowerBook G4 Aluminum
iMac G4
iPod 1st gen
iTunes
iMac
Twentieth Anniversary Macintosh (TAM)
eMate
Newton Message Pad
PowerBook 100 Series
Macintosh Portable
Apple IIgs
Apple IIc
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1977
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From the graph we can notice that the trend of peaks of innovation is not stable. Overtime, the gaps between a pivot product and another become littler. The first period goes from 1977 to 1984. During a seven years timespan there are only 2 peaks of innovation. Instead from 1984 to 1991 (same length gap) the pivot products double, being 4. From 1998, with the introduction of the iMac, the pivot products are more frequent. In fact until 2006 they are 8, doubling again.

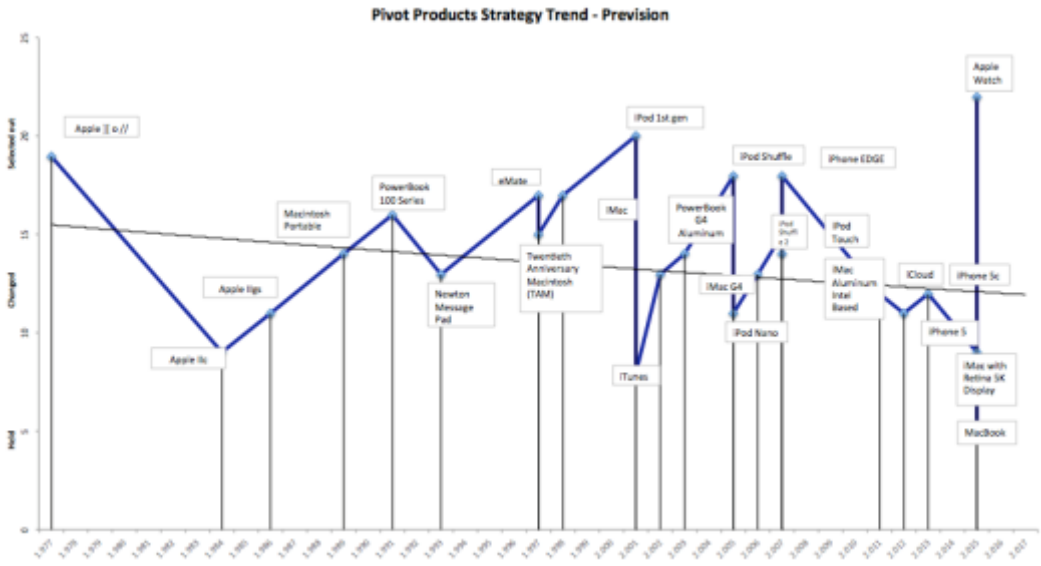
In conclusion, the closer we get to the present days the more innovations are nearer each other. Innovative products that affect the others are changed continuously, selecting new elements from outside to bring new features.

Therefore we can expect that in the near future innovations will become more and more dense and the variability of the characteristics will increase significantly.

Chapter 4

Conclusions and personal considerations

In the next graph it has been outlined a trend line to discover what could be the future implications of this strategy.



We can expect that there will be more and more frequent peaks of innovation. The level of contagion will be stable but slightly tending to change. In my opinion the products that will be conceived in the future will be influenced by other extremely innovative pivot products disrupting other markets (e.g. automotive industry[38], home automation market[39], TV market), but their characteristics will be held or changed internally to create around them an ecosystem, following the concept on which the company is based: the digital hub.

The key success factor of Apple strategy is given by the fact that it is a pioneering company, developing ideas capable of anticipating market trends.

[38] Apple and one or two major carmakers could get together to begin a new era of intelligently connected automobiles that marry dedicated applications, an ecosystem of services and constant Internet connections. The impact could be huge on the future of road travel.

[39] The former Head of Hardware, Tony Fadell, started a path toward the home automation market. He has created the Nest thermostat that is connected to the Internet and is smart enough to watch heating and air-conditioning habits, adjusting them automatically. This suggests that the concept of the smart home was in the works when Fadell was with Apple and that Apple has been working on this internally for some time.

Apple team works on innovation technologies thinking already how to make them obsolete. They think how to disrupt it, looking forward, even while they are creating it.

In my opinion, following this successful strategy will make Apple one of the most long-lasting companies in history. Furthermore it will help Apple to diversify more and more its products portfolio, entering new markets. Therefore, Apple will be always more part of our lives making them simpler and more efficient, making people multi-tasking and smarter, revolutionizing again the way to communicate and build relationships.

Even if Apple team surely has clear ideas about how disrupt itself, the company could meet fierce competitors on its way. Or even not direct competitors such as NASA could do smart moves.
This strategy of contagion system can generate problems in the evolution.
A decline may happen only with a very strong technological leap, as it was the iPhone. Innovative technologies such as holograms, long-lasting batteries, flexible displays could drive away customers' attention by Apple products. Samsung has already implemented a prototype of a flexible screen. It is the unnamed concept Windows Phone 8 device which employs a fully flexible AMOLED display.

Google's executive chairman, Eric Schimdt, and MIT of Boston have anticipated some of the future disruptive technological innovations. Among these, there is the application to the biological processes of computing. Ten years is the time horizon for a glimpse of the first technologies in this regard: prenatal genetic analysis and other applications that allow the DNA analysis against certain genetic diseases. They will be joined by advanced computer graphics chips to traditional processors and will allow an advanced screening.
The *predictive computing* will be the future artificial intelligence. Overcoming Siri, it will help the user, through cloud, big data and more complex analytic systems.
Nanotechnologies and 3D printers will be able to materialize even the simple tastes and the intangibles or even organs. There are already rumours about 3D biological tissues printed through stem cells.

Despite future innovative breakthroughs and competitors, after having given a *personality* to the computer, destroyed market after market and overcome its founder's death, with the following of millions of fans, Apple has all the prerequisites to survive a world that is constantly changing.

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Summary

This thesis is dedicated to the analysis of product strategies adopted by one of the most revolutionary companies in the last decades: Apple Inc.
The first chapter will introduce the Company, outlining which are the elements of differentiation that distinguish Apple from the other companies working in the same field. It will be highlighted the indisputable relevance of its founder and former CEO, Steve Jobs, who made Apple a disruptive innovator.
Apple Inc. is a company at the epicentre of American business and culture. Furthermore it is one of the most renowned companies in the world. It leads innovation with its products and it is part of life for millions of people around the world.
Apple has represented the start of a new era in which devices are essential to improve life quality, now even monitoring the health status. Devices such as the ultimate Apple product, the iPhone, and the very latest wearable technology, the Apple Watch, are studied and intended to follow the user, heading him or her to a best way to live, monitoring for instance the time spent sitting down, standing up, training or measuring heart rate.
Steve Jobs started his activity from an idea. He conceived and implemented a new and unconventional way to manage a firm, based on simplicity. Simplicity to Steve Jobs is the key concept and it represents also a weapon. He proved that simplicity is the most powerful force in business. It guides the way Apple is organised, how it designs products, and how it connects with customers.

An archival and visual research work on Apple products will follow. It will explain the evolution of Apple products. For each product have been identified its *parents*, that are products by which they are influenced the most.
After having done this research study about the products and their characteristics, from 1976 since now, I have deduced some elements of contagion changing during Apple history along the *family tree* of products. The elements taken in consideration have been: user interface, design, colour, portability, screen, processor and manufacturing process.
A paragraph has been dedicated to each of these elements. It will explain how they have evolved overtime. Each characteristic of these elements has been held, changed or selected out, depending on the different strategy adopted over the years.

Surely one of the most peculiar characteristics to take in consideration is the user interface. It is the most relevant feature in all Apple products because it internalizes the main concept on which Apple is based: the simplicity.

Since Apple II was born, the user interface has been conceived as something of innovative but overall user-friendly. The computer was intended to satisfy ordinary people needs.
The user-friendly design and graphical display made Apple a leader in the first decade of personal computing.
Innovations like the mouse were introduced to make almost everything possible and simpler. The Lisa was the first computer to bring a mouse. Now it was just needed to point-and-click at tiny pictures on the screen with a small rolling device to give inputs to the computer.

The simplicity idea grows with the cutting-edge iMac in 1998. In this model the attention was given to the out-of-box experience. The user needed to go through only two steps to set up and connect to the Internet. There was no step three.

An extraordinary and drastic turning point in the user interface is caused by the creation of iTunes. With iTunes, Apple had made complex applications easy, and made them even more powerful in the process.
iTunes was not only the dramatic change of the user interface, but merely the start of a strategy that would redefine the company as more than a Mac maker.

The peak of iTunes's path and of the digital hub era is iCloud, which is the outstanding evolution of the user interface. It allows the users to have their files available in different ways and places and on different devices. The content shown is quite the same way on each single device. This has helped to homogenize several various user interfaces, converging them toward a unique simple and intuitive way to use the device.

The first tactile approach to the user interface comes along with the iPod 3th generation's Click Wheel. It is one of Apple's best interface innovations to date. The touch-sensitive wheel will be adopted for all the next iPods, only with few changes, until the iPod Touch, coming with the same multi-touch screen of the iPhone era.

The iPhone EDGE is indisputably the start of a new kind of user interface. Steve Jobs, in the keynote of 2007, defines it as the *Revolutionary User Interface*. It is the result of years of Research and Development and of course it is an interplay of hardware and software.
At that time there were some smartphones such as BlackBerry, Moto Q, Palm Treo, Nokia E62. The problem with them was that their user interfaces is really sorted at the bottom of them. They all had keyboards, which were there, but they were not needed to be there. They had control buttons all fixed

in plastic. But overall they were the same for every application, whereas every application wants a slightly different user interface, a slightly optimized set of buttons just for it.
This problem was solved in computers, twenty years before, with a big map screen, that can display anything, put any user interface up, and a pointing device, the mouse.
Thanks to Apple it was possible to take this to a mobile device, "getting rid of buttons and just make a giant screen."

After the introduction of revolutionary user interfaces, mouse and click wheel, Apple brings the Multi-Touch technology to the market. And each of these revolutionary user interfaces has made possible of revolutionary products: the Mac, the iPod and now the iPhone.
The introduction of the multi-touch screen makes more actions possible. This new technology, firstly introduced by Apple, would allow people to use two or three fingers instead of just one. This means that the options and inputs could be more and more, and all without having the obsolete keys and buttons, and overall in a faster and reactive way.
It would afford much more sophisticated interfaces than simple-finger button presses. Keyboard, mouse, pen or even a click-wheel now they were not necessary anymore.
The user would have touched the new interface, and this is obviously more intimate. Thanks to it the contact between the user and a sophisticated device is possible, and this has made the iPhone an indispensable device, part of people's lives around the world.

The computer OS was adapted into a brand-new operating system for the phone, giving birth to the famous SpringBoard. It is the standard application that manages the iOS home screen. It shows all the basic Apps available on the iPhone.
The SpringBoard has changed during years on iPhones and different devices, such as the brand-new product, Apple Watch, in which is very different and it can be used thanks to the digital crown. The device runs Watch OS, a variated iOS headed by vice president Kevin Lynch. Instead of the traditional springboard home screen found in iPhone or iPad, the Apple Watch runs a carousel of round icons that change in scale and position.

The iPhone's user interface has influenced computers' one. From the introduction of the iPhone we notice a high level of contagion by its user interface to computers and other devices, such as the MacBook Air 2008. New to it is a large multitouch trackpad, which lets MacBook Air users do the same kind of things iPhone users can.

But the most influenced device by the iPhone's user interface is the iPad. The iPad and iPhone's development projects were simultaneous and, not surprisingly, they shared numerous elements, including the UI.

Jonathan Ive is Apple's Chief Design Officer and one of the most visionary designers in the world. He has provided a real breakthrough in Apple's products history. He changed many times the design of Apple products, giving them an elegant and innovative footprint. Its work has influenced many of the main changing characteristics: design most of all, colour as a consequence and portability, which has always fascinated him. Everything is dominated by simplicity and perfection. There are no frills and every detail is conceived to be essential and cutting-edge.
The entrance within the company of Ive will come later in 1997. The first period of Apple has been characterized by products featuring already an innovative design for that time. Nevertheless this was a trial and error phase, given that they were trying to define the image of the company.
Until 1997, the year when Steve Jobs returned to Apple after the period in which he was forced out, there were few design changes.
The disruptive point will be set in 1997 with the Twentieth Anniversary Macintosh and in 1998 with the iMac.
The period that comes from 1984 to 1990 have seen the presence of a design language, called Snow White.
A stunning explosion of colours happens in 1998. The iconic iMac came to the market, changing dramatically the Macintosh hardware. Until 1998, personal computers looked like beige boxes surrounded by tangles of peripherals and wires. Then came the iMac, the brainchild of Apple's head of design Jonathan Ive. It came in several different colours and was made of translucent "Bondi Blue" - coloured plastic.

About the materials, Jonathan Ive, heading the Apple's Industrial Design Group, decided to move from titanium to aluminium. The early PowerBook G4 models really made of Titanium. The cases used by early PowerBook G4 models are made of 99.5% pure grade CP1 (commercially-pure) Titanium with a rigid carbon fiber frame. Instead the PowerBook G4 is created using aluminium, which was surely less expensive than titanium.
The iSight is one of the first Apple products to use aluminium as it primary housing material.

The cultural icon iPhone EDGE has a stunning design, featuring a gently curved back snapped seamlessly onto the screen, like the original iPod. Most importantly, it had Jony's infinity-pool illusion, which is perceived thanks to the screen, one of the next characteristics analysed.

When the phone was off, it appeared to be a single, unbroken, inky-black faceplat; when switched on, the screen magically appeared from within.

To evoke the explosion of colour happened inside Apple in 1998, is the iPhone 5c. Apple had previously done with the iPod lineup, including the iPod touch, having a dedicated device at a lower-price point let them use colour as a differentiator. Set against the traditional black/slate and white/silver of the premium line, the iPhone 5c popped in plastic tinted bright green, blue, yellow, pink, and white.

Portability maybe is the most interesting and fascinating element to study. Portability is a concept that has always been taken into consideration by Apple during its history. This characteristic has to be improved and innovated to satisfy always more consumer needs. From the start till nowadays the more technology has been part of people's life, the more are increased peoples' needs. Different devices surround us and we interact with them. This phenomenon pushes the need to have always available and more reachable devices to be always updated, even wearing them.
The path from the simple *portable* to the more intimate *wearable* lasted for more than thirty years.

The real portable computer was launched in 1989. The Macintosh Portable is the first battery-powered portable Macintosh personal computer.

Definitely a step toward the future was done with the Newton Message Pad in 1993 and the Newton Message Pad 110. The concept of portability is expanded. We can notice same elements that revoke even the iPhone (2007): the screen that could be turned horizontally as well as vertically; a large screen; the logo on the bottom then replaced by the Home Button.
Another device similar to the iPhone and the iPad was the too innovative eMate, a personal digital assistant.

The iMac '98 had a handle built into the top of the computer. Jonathan Ive explained the decision, saying, "Back then, people weren't comfortable with technology. If you're scared of something, then you won't touch it." He continued, "I thought, if there's this handle on it, it makes a relationship possible. It's approachable. It's intuitive. It gives a sense of its deference to you." At the old Apple without Jobs, Ive's handle would have never been approved because it was a superfluous feature that only added cost. At the new Apple with Steve Jobs in charge, the handle stuck. Every detail is there for a reason.

The concept of portability is enlarged and revolutionized once again and transformed to wearability in 2015. The device is not with you but on you, on your wrist. The Apple Watch is the most personal computer ever conceived. It is small and simple to use.
Innovation is studied in every interaction. Apple has invented all-new ways to select, navigate, and input that are ideally suited to a smaller device worn on the wrist.

About the screen, in the first models there were no screens but the computer had to be connected to a monitor. Then, together with the evolution of the UI, the display has become something of extremely necessary and every computer came with a monitor.

Since the transition on October 14, 2008 to the Aluminum models, Apple removed the matte, anti-glare screen as an option for its Cinema Displays. As a consequence, the Cinema Displays have been available from Apple only with a glossy screen. Apple removed the matte screen option from its line of iMac desktop computers on August 7, 2007, so Apple does not offer any desktop equipment with a matte, anti-glare screen. This has caused concern among a segment of users that desire matte screens for their particular area of work, for example, graphic designers, photographers, and users that view their screens for many hours per day.

Retina Display (marketed by Apple with a lowercase 'D' as Retina display) is a brand name used by Apple for screens that have a higher pixel density than their previous models.
Retina means the display density is high enough that, when held at a normal viewing distance, individual pixels disappear and all someone with 20/20 eyesight can see is the content. This happened in print media decades ago, it happened with products such as the iPhone in 2010, the full-sized iPad in 2012, and now the iPad mini in 2013.

Apple during its products' history has changed several types of processors. The last iMac 5K now is the most most powerful iMac yet with a quad-core Intel Core processor available at up to 4.0GHz.
In a paragraph it is explained the reasons of the transition to Intel Processor, which has represented a break point.

The manufacturing process is extremely relevant in Apple company, because the innovation comes along with it. Not only the innovation comes from within manufacturing process but also the design. During the first period of Apple without the presence of Jonathan Ive the all-in-one design dominated almost all products from 1995 on. When Ive joined the company he favoured the change from titanium to aluminium, designing some of all the most successful products using this different material.

Furthermore he introduced the Unibody Manufacturing Process. The experience led to stunning outcomes.

At the end of this evolutionary analysis from the point of view of each changing element, we could choose along the family tree some products, whose characteristics are disruptive and which are significant for other products in the same timespan. This kind of products will be named for this reason *pivot products*.
Pivot products represents the moment in which there is a break point in the history of the company. Their characteristics are those that change and influence the most.
They give birth to features that will be recurring in other products, so they can be seen as *parents*.

Before the third chapter it has been created a timeline chart in which different coloured lines represent the contagion from a product to another.

To identify pivot products we have used a quantitative method. For each product it has been assigned a level of contagion for each of the characteristics analysed: user interface, design, colour, portability, screen processor, manufacturing process. Then it has been created a chart reporting the sum of all the levels.

The possible values of this index range from 0 to 4. A high level of contagion (3 or 4) has been assigned to pivot products because of their high influence. Their characteristics are new and they have been selected out, not internally. The influence of these products on others is very high but they are not very much influenced from previous products. They are innovative and disruptive.
If the level of contagion is low, to the product will be assigned 0, and it means that the product's characteristics have not been changed respect to the related pivot product. These products do not influence very much the others but they follow the trend of pivot products' characteristics.
If the characteristics are only modified respect to pivot products, the level will be around 1 or 2, according to the relevance of the alteration.

The level of contagion results high or low in periods, which respectively present less change in the company choices or a high level of innovation.
Through the analysis of contagion across products will be outlined at the end of this work the strategy followed by Apple. This will allow answering to the research question, identifying the different periods experienced by the company.

The characteristic which has influenced the most the strategy of Apple is the design, followed by UI. In fact they are the most peculiar traits on which Apple has been focused since it was born. The colour mostly follows the design. It changes dramatically overtime but it is quite stable and not so variable as the design and UI. The less relevant characteristic, from the point of view of level of contagion, is the processor. It has changed during the history but only few times. The portability factor is quite significant. It is characterised by breaking points and it is variable. This characteristic in my opinion will be always more variable, transforming again the hi-tech industry and changing again the way to use devices. My forecast is that this characteristic will be more and more innovative and disruptive, so much to overcome design.

From the created graph we can notice that the trend of peaks of innovation is not stable. Overtime, the gaps between a pivot product and another become littler. The first period goes from 1977 to 1984. During a seven years timespan there are only 2 peaks of innovation. Instead from 1984 to 1991 (same length gap) the pivot products double, being 4. From 1998, with the introduction of the iMac, the pivot products are more frequent. In fact until 2006 they are 8, doubling again.
In conclusion, the closer we get to the present days the more innovations are nearer each other. Innovative products that affect the others are changed continuously, selecting new elements from outside to bring new features.
Therefore we can expect that in the near future innovations will become more and more dense and the variability of the characteristics will increase significantly.

We can expect that there will be more and more frequent peaks of innovation. The level of contagion will be stable but slightly tending to change. In my opinion the products that will be conceived in the future will be influenced by other extremely innovative pivot products disrupting other markets (e.g. automotive industry, home automation market, TV market), but their characteristics will be held or changed internally to create around them an ecosystem, following the concept on which the company is based: the digital hub.

The key success factor of Apple strategy is given by the fact that it is a pioneering company, developing ideas capable of anticipating market trends.
The team works on innovation technologies thinking already how to make them obsolete. They think how to disrupt it, looking forward, even while they are creating it.

In my opinion, following this successful strategy will make Apple one of the most long-lasting companies in history. Furthermore it will help Apple to diversify more and more its products portfolio, entering new markets. Therefore, Apple will be always more part of our lives making them simpler

and more efficient, making people multi-tasking and smarter, revolutionizing again the way to communicate and build relationships.

Even if Apple team surely has clear ideas about how to disrupt itself, the company could meet fierce competitors on its way. Or even not direct competitors such as NASA could do smart moves.
This strategy of contagion system can generate problems in the evolution.
A decline may happen only with a very strong technological leap, as it was the iPhone. Innovative technologies such as holograms, long-lasting batteries, flexible displays could drive away customers' attention from Apple products.

Samsung has already implemented a prototype of a flexible screen. It is the unnamed concept Windows Phone 8 device that employs a fully flexible AMOLED display.
Google's executive chairman, Eric Schimdt, and MIT of Boston have anticipated some of the future disruptive technological innovations. Among these, there is the application to the biological processes of computing. Ten years is the time horizon for a glimpse of the first technologies in this regard: prenatal genetic analysis and other applications that allow the DNA analysis against certain genetic diseases. They will be joined by advanced computer graphics chips to traditional processors and will allow an advanced screening.
The *predictive computing* will be the future artificial intelligence. Overcoming Siri, it will help the user, through cloud, big data and more complex analytic systems.
Nanotechnologies and 3D printers will be able to materialize even the simple tastes and the intangibles, or even organs. There are already rumours about 3D biological tissues printed through stem cells.

Despite future innovative breakthroughs and competitors, after having given a *personality* to the computer, destroyed market after market and overcome its founder's death, with the following of millions of fans, Apple has all the prerequisites to survive a world that is constantly changing.