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**READING LIST**

**MODULO E**

1. Difference between Digital and Traditional Photography;
2. Parts of Digital Cameras;
3. History of digital cameras.

# 1. DIFFERENCE BETWEEN DIGITAL AND TRADITIONAL PHOTOGRAPHY

Photographers worldwide have differing opinions on whether a digital or film camera is better. As technology evolves, photographers are continually upgrading their cameras. On the other hand, many still rely on traditional film cameras.

The major difference between traditional film cameras and digital cameras is you need to purchase film and to develop it to see the images. Most people scan their negatives but traditionally photographers created prints in the darkroom. Digital cameras use digital storage to save images and generally need a digital device to edit the images.

Digital Cameras	Traditional Film Cameras
Easier access to editing: just need a computer, tablet, or smartphone	Generally higher-resolution photos with better color rendition
Some digital cameras show in real-time what the camera sees (smartphones and mirrorless cameras)	Prints last longer much longer but require a darkroom to print yourself
High initial cost	Costs add up over time (buy film, need to develop film, & scans)
images are ready to share immediately	Need to develop negatives to see the images
All digital cameras require batteries and needs to be recharged	Many film cameras only need batteries for the light meter and still work fine without them

The most significant similarity between a digital and a film camera is their ability to take photos but they differ on how and what you do after you take the image. Whether you're capturing a moment you want to remember forever, taking portraits, landscapes, or street photography both types of cameras will do an excellent job. Both cameras can produce high-quality images.

Most digital and film cameras come equipped with a lens, flash, and a viewfinder. Aperture, shutter, and ISO settings are essential pieces of photography to control the light entering the camera so both camera types have these tools.

Both Analog and Digital cameras have a lens, flash, and viewfinder, and both take photos. Nevertheless, there are many differences, advantages, and disadvantages to using each.

Digital photos can be easily manipulated. Photos taken on a film camera cannot be manipulated until the negatives are scanned or used to make a print in the darkroom. However, digital cameras are constantly evolving with new technology so much so that your new digital camera may be obsolete in a few years like many from the 1990s. Film cameras never go out of style or lose their advantages and many cameras made as early as the 1920s (or before) still work just fine.

## Cost of Film and Digital Photography

The cost can be an essential factor in determining if you want to use a digital or ordinary camera. Regardless of which type of photography or camera you choose, it's an investment well worth it.

Digital photography may be cheaper in the long run, mostly because you can immediately fix photo issues by taking a new one. In contrast, the film would require extra hours and lost film.

Film cameras are time and money investment. The cost of film, developing, and scanning adds up over time. The best way to save some money with film photography is to develop the film yourself – after investing in the right chemicals and equipment. On the other hand, digital photography has an expensive up-front investment, but there's not much more money involved after that. After the initial investment of buying the camera and desired add-ons, there isn't much more you need to buy.

### Comparing Image Quality

Digital cameras have controls that automatically adjust exposure and focus the image for you. To get the best quality photos on a DSLR, it's best to stay in program or manual mode. This makes it easier to be as precise as possible when taking digital images. Severe under or overexposure can be difficult to fix in editing.

Film cameras have a higher resolution (depending on the scan) and more latitude, so photographers don't need to be too precise with the exposure. A good photo taken with an analog camera is typically higher in quality. Film photography also has a higher dynamic range, better color transitions, and controls the highlights better. On the other hand, digital camera handle shadows much better.

When thinking of convenience and time spent on analog vs. digital photography, it's essential to consider how much time you want to spend on it. For quick and efficient photos, digital is the way to go. From taking a shot to editing and sharing, the process can take as little as 10 minutes if you're using a smartphone or tablet.

If you have the time to invest in analog photography, the photo quality could be well worth it. The same shooting process, processing, scanning, and editing can take up to two or more days. If you send your film to a company to develop the negatives for you, it could take much longer.

### Shelf Life and Storage of Photos

Memory card storage and permanent storage for files from a digital camera are much cheaper than storing film photos. They don't take up a lot of space and are relatively inexpensive. Film cameras require film canisters and film storage books, which can take up a lot of space, and need to be properly stored away from sunlight, humidity, and heat. However, memory cards are easily lost, can be corrupted (lose your data), and aren't waterproof.

Also, generally, the image quality of a digital photo doesn't worsen over time, whereas analog photos tend to disintegrate over time – like slide film – even if properly stored.

Digital photography is becoming more popular with the age of smartphones. It's quicker, more comfortable, and convenient than traditional film or DSLR photography. Electronic photodetectors capture an image either manually or automatically focused by the camera's lens. Digital

photography allows users to take images without the need for developing with chemicals, the use of negative film, and allows for them to be edit electronically.

Digital cameras produce images of the modern world. They provide instant gratification, making it easy to quickly share your image with friends and family. The pros and cons below describe what’s great (and not so great) about digital photography:

Pros of Digital Photography	Cons of Digital Photography
Instant photo review	Equipment is expensive and can easily break
You can correct problems with photos by quickly taking another	Picture quality isn’t always perfect
Memory cards provide semi-permanent storage	Exposure problems are hard to fix

Traditional film photography has been around since about the 1900s. The process used to create images using a film camera won’t be changing anytime soon. This form of photography uses photographic negative film to capture images. The film is usually plastic, transparent, and coated with microscopic light-sensitive crystals on one side. You need to develop the images in darkness before you can see the images.

After capturing the photo, the photographer uses a combination of a light-tight room or bag and developing tank with a series of specialized chemicals to treat the film to create a negative. Then the photographer uses an enlarger in a darkroom, usually lit by a red light, to project light through the film negative onto light-sensitive photography paper to create a visible image.

The darkroom with a red light is necessary because darkroom paper is exceptionally light-sensitive until adequately treated, except for specific colors like red.

Traditional photography is an age-old tradition. There’s nothing like the anticipation while waiting for a beautiful photo to come to life in the darkroom. The following pros and cons outline the best – and worst – aspects of traditional photography:

Pros of Traditional Photography	Cons of Traditional Photography
Don’t need to know how to use a computer to print and produce photos	There’s a delay between capturing an image and seeing the results
Cameras are inexpensive and don’t require large batteries	Developing the negative film and/or paper is a time-consuming activity; it’s often hard to get the exact image you wanted
Photo details are arguably better than digital	Pictures can’t be easily edited or manipulated as digital images

# 2. PARTS OF DIGITAL CAMERAS



## Parts of a Camera and Their Functions

Modern digital cameras all have the same basic parts. Here are labeled parts of a camera, how they work, and what they contribute to the photo making process:

### Viewfinder

The viewfinder is one of the most important parts of a camera. It is a rectangular-shaped part at the back of your camera that lets you see and frame your subject. Some viewfinders are fully digital, which shows you various details like your shutter speed, aperture, and ISO before you take the shot.

### Pentaprism

The pentaprism is a mirror placed at a 45-degree angle behind the camera lens. The mirror projects the light captured from the lens to the viewfinder. Before pentaprisms, photographers always had to look downwards when taking photos. This is not ideal for some subjects and would only allow you to take photos at hip-level. Pentaprisms got rid of this problem and now define single-lens reflex or SLR cameras.

### Built-in Flash

A built-in flash is the part of the camera's anatomy that produces a burst of light (i.e., a flash of light) when triggered. It has a fixed position on the front or top of the camera to allow it to illuminate the subject. The built-in flash fires only when the camera takes a picture.

### Flash Button

The flash button is present on cameras with a built-in pop-up flash. Its main functionality is to force the flash to open before triggered. At the same time, on some cameras, if you hold press the flash button, you can adjust the intensity of the flash by setting the flash exposure compensation.

### Lens Mount

A lens mount is the mechanical fitting that allows the lens to attach to the camera. You can only use lenses that match your camera's lens mounting system. Some camera manufacturers use proprietary lens mounting systems to ensure clients will use their lenses.

### Lens Release Button

The lens release button unlocks the lens mount and allows you to detach the lens. Although you can attach the lens in one step, as a safety measure, you can only detach it by pressing the lens release button. You'll find it on the front of the camera, near the lens mount.

### Mode Dial

A mode dial is one of the most used parts of the camera. It is a small cogwheel situated on the top-right of the camera that switches between the camera's modes (i.e., ways of operating). Additionally, a camera may have multiple modes, including manual, automatic, and semiautomatic settings, and scene-based.

## **Focusing Screen**

A camera's focusing screen is the glass surface on which the camera's mirror projects the image. The focusing screen helps in achieving various focus effects such as sharp and high-contrast shots to blurs and bokeh.

## **Condenser Lens**

A condenser lens has two matching convex lenses. This part uses a simple method for correcting color fringing or aberration that is a common problem encountered when using traditional camera lenses.

## **Digital Sensor**

The digital sensor of a camera is one of its most delicate parts. This sensor captures the light coming from the lens to create an image. Modern cameras use either a charged-coupled device (CCD) or a complementary metal-oxide semiconductor (CMOS) imager for capturing images.

## **Grip**

The grip is the right side of a camera, which has a special curved design to allow you to comfortably handhold the camera. It usually provides space to place your fingers and securely hold the camera. The grip usually has a different texture than the rest of the camera.

## **Shutter**

The shutter is an opaque piece of metal or plastic that controls the amount of light that reaches the camera sensor. Additionally, the length of which your shutter stays open will determine how your exposure will look like. You can activate this using the shutter release button and adjust it accordingly using your camera's shutter speed setting.

## **Display**

The camera display shows the user helpful information about the photos and the camera. Here you will see the different camera settings you can tweak to alter your exposure, ISO, shutter speed, and more. You can also access other menus using this display to change the settings on your camera. Most camera displays nowadays let you see how your image will appear before you press the shutter release button. This feature revolutionized digital cameras as it helps photographers in creating consistent shots.

## **Electronics**

Your camera's electronic components are divided into three separate categories: photo capture components, camera controller, and user interface components. The controller elements control all the electronic components of the camera. Its photo capture elements are responsible for the recording of images. Meanwhile, the user interface elements are responsible for letting the user interact with and control the camera.

## **Remote Control Sensor**

A remote control sensor is an electronic device (usually an infrared device) that allows you to connect the camera to remote controls. Once you make the connection, you can use the remote control to trigger the shutter from a distance or at a predetermined moment.

## **Shutter Button**

The shutter button is one of the most iconic parts of a camera. The button tells the camera to release the shutter and take a picture. DSLR cameras assign a second functionality to the shutter button: the button triggers the camera's autofocus system when it is half-pressed.

## **Autofocus System**

One of the advantages that digital cameras have over traditional film cameras is their ability to focus on a particular subject quickly and automatically. This is possible thanks to the autofocus sensor, one of the parts of a lens that sends information to the computer inside the camera and commands the lens to adjust its focusing elements to render a sharp image.

## **Reflex and Relay Mirror**

The reflex mirror is in any SLR or DSLR camera. Unlike rangefinder cameras, the lens of a DSLR is not on the same axis as the lens, which is why this type of camera needs a mirror. The reflex mirror is a mirror positioned at a 45-degree angle to reflect light from the lens to the viewfinder, enabling you to see what the lens sees.

## **Aperture**

Aperture is one of the three pillars of determining the exposure of your photographs. Additionally, aperture is the opening in your lens through which light passes through. This part has small, thin blades that shrink or expand depending on how much light you want in your exposure. It also determines the depth of field of your camera, which is a vital factor in how much background blur you want.

## **Main Dial**

The main dial is a cogwheel situated on the front part of the camera that allows you to adjust aperture, shutter speed, exposure compensation, and other parameters. On some cameras, the main dial can help you navigate through the images on the memory card.

## **Hot Shoe**

The hot shoe, a U-shaped metal bracket situated on top of the camera, is among the basic parts of a camera. It is a mechanical fitting that allows you to connect an external flash unit and other accessories such as radio triggers, external microphones, and light meters.

## **Zoom Elements**

Zoom lenses allow to shift between focal lengths, from wide to telephoto, depending on your lens' focal range, by turning the lens rings.



## **Batteries**

Lastly, the battery is one of the most important parts of the camera. Most of its components will not work if not powered by one. Having a long-lasting battery lets you shoot more photos and shoot for extended periods, allowing you to find the perfect shot.

### 3. History of digital cameras: From '70s prototypes to iPhone and Galaxy's everyday wonders

The digital camera has come a long way. The camera in your pocket is pretty amazing. Back in the 20th century when cameras needed film, digital camera technology began as an astronaut. Since then, Kodak, Apple and many others have played important roles in developing today's pocket-sized marvels. Let's dive into digital camera history to mark the milestone devices and the groundbreaking tech.

#### The beginnings

The history of the digital camera started in 1961 with Eugene F. Lally of NASA's Jet Propulsion Laboratory. When he wasn't working on artificial gravity, he was thinking about how astronauts could figure out their position in space by using a mosaic photosensor to take pictures of the planets and stars.

Lally actually figured out how to solve red eye in photos, but unfortunately his theory of digital photography was still way ahead of the existing technology. It was the same story 10 years later when Texas Instruments employee Willis Adcock came up with a proposal for a filmless camera. It wasn't until 15 years later that the digital camera became a reality.

#### The first digital camera

The first actual digital still camera was developed by Eastman Kodak engineer Steven Sasson in 1975. He built a prototype a movie camera lens, a handful of Motorola parts, 16 batteries and some newly invented Fairchild CCD electronic sensors. The resulting camera, pictured in 2007 on its first trip to Europe, was the size of a printer and weighed nearly 4 kilograms. It captured black-and-white images on a digital cassette tape, and Sasson and his colleagues also had to invent a special screen just to look at them.

Kodak's 1975 prototype had a resolution of 0.01 megapixel. It also took 23 seconds to snap the first digital photograph. Today's Apple iPhone 15 lineup work on periscope telephoto lens technology and is rumored to feature a Pro-like 48 Mega Pixel camera.

#### The end of film?

The charged-couple device (CCD), invented in 1969, was the breakthrough that allowed digital photography to take off. A CCD is a light sensor that sits behind the lens and captures the image, essentially taking the place of the film in the camera. The first cameras to use CCD sensors were specialist industry models made by Fairchild in the 1970s.

Canon launched the first analog electronic camera to actually go on sale, the RC-701, in 1986. That pro model was followed by a consumer model, the RC-250 Xapshot, in 1988. The Xapshot was called

Ion in Europe or Q-Pic in Japan. It cost \$499 in the US, but consumers had to haul out another \$999 on a battery, computer interface card with software, and floppy disks.

These kinds of cameras never really took off, however, due to poor image quality and prohibitive cost. Their ability to transmit images meant they were mainly used by newspapers to cover events such as the 1984 Olympics, the Tiananmen Square protests of 1989 and the Gulf War in 1991.

### The coming of true digital

The first true digital camera that actually worked was built in 1981. The University of Calgary Canada ASI Science Team built the Fairchild All-Sky camera to photograph auroras in the sky.

The All-Sky Camera used more of those 100x100-pixel Fairchild CCDs, which had been around since 1973. What made the All-Sky Camera truly digital was that it recorded digital data rather than analog. Meanwhile, in October 1981 the digital revolution rolled on with the release of the world's first consumer compact disc player, the Sony CDP-101.

### Colani's concepts: Almost the future of cameras

In 1983, Canon commissioned Luigi Colani to envision the future of camera design. The outspoken designer believed that an egg is the highest form of packaging and employed his "no straight lines in the universe" philosophy to create these innovative concepts: the Hy-Pro, an SLR design with an LCD viewfinder; a novice camera named the Lady; the Super C Bio with power zoom and built-in flash; and the underwater Frog.

He also designed the HOMIC, or the Horizontal Memorychip Integral strobe Camera. This was a spaceship-esque concept for a still video camera recording to solid-state memory. Unusually, the lens and viewfinder were on the same axis, while the flash fired through the objective lens. The HOMIC was exhibited at 1984's Photokina exhibition but never went on sale.

### Digital hits the shops

The first genuinely handheld digital camera should have been the Fuji DS-1P in 1988. It recorded images as computerized files on a 16MB SRAM internal memory card jointly developed with Toshiba, but the DS-1P never actually made it to shops.

The first digital camera to actually go on sale in the US was the 1990 Dycam Model 1. Also marketed as the Logitech Fotoman, this camera used a CCD image sensor, stored pictures digitally and connected directly to a PC for download -- in other words, just like the cameras we later became familiar with.

### Digital develops

JPEG and MPEG standards were created for digital image and audio files in 1988. Digital Darkroom became the first image-manipulation program for the Macintosh computer in 1988, and Adobe PhotoShop 1.0 arrived in 1990.

Mosaic, the first web browser that let people view photographs over the web, was released by the National Center for Supercomputing Applications in 1992. That year also saw the Kodak DCS 200 debut with a built-in hard drive. It was based on the Nikon N8008s and came in five combinations of black-and-white or color, with and without hard drive. Resolution was 1.54 million pixels, roughly four times the resolution of still-video cameras.

### Apple gets in on the action: The QuickTake

The Apple QuickTake 100 launched in 1994 and was the first color digital camera you could buy for less than \$1,000.

It packed a 640x480-pixel CCD and could store up to eight 640x480 images in the internal memory. Despite the Apple logo, it was actually manufactured by Kodak. The follow-up QuickTake 200 was built by Fujifilm.

### Connected cameras and CompactFlash

Epson launched the first "photo quality" desktop inkjet printer in 1994. Later that year, the Olympus Deltis VC-1100 became the first digital camera that could send photos. You had to plug it into a modem, but it could transmit photos down a phone line -- even a cellphone. It took about six minutes to transmit an image. Image resolution was 768x576 pixels, the shutter speed could be set between 1/8 and 1/1000 second, and it included a color LCD viewfinder.

SmartMedia card and CompactFlash memory cards also arrived in 1994. The first camera to use CompactFlash was the Kodak DC-25 in 1996.

### The shape of things to come

The familiar shape of modern compact digital cameras emerged when the Casio QV-10 added an LCD screen on the back in 1995. The screen measured 46mm (1.8 inches) from corner to corner.

The QV-10 also had a pivoting lens. Photos were captured by a 1/5-inch 460x280-pixel CCD and stored to a semiconductor memory, which held up to 96 color still images. Other now-familiar features included close-up macro shooting, auto exposure and a self timer. It cost \$1,000.

In 1995, Logitech debuted the VideoMan, its first webcam that plugged into a personal computer.

### The digital age!

By the 2010s, the digital camera was down to the size of a cassette tape. By the mid-1990s the familiar digital camera shape was established that would last for the next decade or more. In 1995, the Ricoh RDC-1 was the first digital still camera to also shoot movie footage and sound. It had a 64mm (2.5-inch) color LCD screen, and the f/2.8 aperture had a 3x optical zoom. Those remained the baseline specs for compacts for years, but at least the price came down over time. In contrast, the original RDC-1 set you back a hefty \$1,500.

The now-familiar compact shape continued to emerge with the Canon PowerShot 600 in 1996. It had a 1/3-inch, 832x608-pixel CCD, built-in flash, auto white balance and an optical viewfinder as

well as an LCD display. It was the first consumer model that could write images to a hard disk drive and could store up to 176MB. That cost \$949.

Although compacts were sometimes released in weird and wonderful shapes -- such as the Pentax EI-C90, which split into two sections -- the basic form factor remained. By the 2010s, a compact camera was roughly the same size as the tape cassette that Steve Sasson's 1970s prototype needed just to save a single grainy image.

Professional-style SLR cameras also made the transition to digital. The DSLR cameras could swap lenses with their film ancestors, while enjoying the benefits of high-capacity digital memory and a handy screen on the back. The traditional DSLR design is now slowly being replaced by mirrorless cameras from Sony, Canon, Nikon and the smaller Micro Four Thirds alliance from Olympus and Panasonic.

### The camera phone

The big digital revolution was, of course, the camera phone. The Kyocera Visual Phone VP-210 in 1999 and Samsung SCH-V200 in 2000 were the first camera phones. A few months later the Sharp Electronics J-SH04 J-Phone was the first that didn't have to be plugged into a computer. It could just send photos, making it hugely popular in Japan and Korea. By 2003, camera phone sales overtook digital cameras.

In 2007, Apple launched the iPhone, and the smartphone age truly began. The cameras built into phones quickly improved, but a number of factors combined to transform everyone into a photographer: Phone memories got bigger so you could take more pictures; CCD sensors were replaced by CMOS chips that use less power; 3G, 4G and 5G made it possible to share your photos instantly; and photography sites like Flickr soon gave way to social networks like Facebook and Instagram as a place to share your shots.

In 2012, Nokia made a 41-megapixel smartphone, the Nokia 808 PureView. Feature films have been shot on iPhones, and lightweight consumer drones have taken digital photography to the skies. Today's best camera phones routinely come with two, three or four cameras to capture even better images. Smartphones' computer power also freed computational photography, processing technology that jumps across the limits of lenses and image sensors. And the latest buzzword is "pixel binning," used in regard to the Samsung Galaxy S21 Ultra 5G for its huge 108-megapixel cameras.

Fortunately, we can expect the advancements to keep coming, and the day will come when today's camera phones look like relics too.