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Touch screens have been around for longer than you think. These days, when people think of touchscreens, they tend to think of popular consumer products, such as smartphones and tablets, which are now widely available. However, you have been using touchscreen technology since long before those devices entered the mainstream, and these types of screens have been critical to the advancement of the businesses that use them. Generally, technology historians say that the foundation for touch technology started with the music industry, with touch-sensitive synthesizers. These were developed in 1948, starting with Hugh Le Caine's Electronic Sackbut. This device involved the use of a piano keyboard and a control board, and people playing the instrument could use touch to control the volume via pressure on the keys, while also changing the texture options for the music via the control board. Fast forward several years to 1965, the application of this touch technology to screens began with the E. A. Johnson Touchscreen. This screen originated out of England's Royal Radar Establishment and was a basic version of the touchscreen technology that eventually went on to emerge in ATMs and customer service kiosks of all types. The first widely-known and used touch screen is credited to the University of Illinois, which developed the PLATO IV terminal in 1972. The school had been developing a series of educational computer systems throughout the '60s, and this particular system utilized an infrared touch panel, which students would use to answer questions. The system was used throughout the state in many Illinois classrooms. In 1982, touchscreens took another leap forward with the introduction of multi-touch technology. The original method for accomplishing this involved using a video camera that was able to interface with a computer. The concept was later put into use in screens in 1984, and its first uses involved enabling people to manipulate computer graphics using their fingers. The technology continued to evolve through the '80s and '90s, with the introduction of the keyboard and mouse, and the Simon Personal Communicator Phone in 1993, which included a pen-based sketchpad. Eventually, in 2007, the use of touchscreen technology in consumer devices became popular, leading to the surge in popularity we have been experiencing through the present day. Discover how touchscreens can help you make an impact in your everyday meetings! More than 90% of touchscreens are capacitive. Touchscreens have an average durability period of 3 years. Almost all touchscreen devices feature a Liquid-Crystal Display, LCD. The concept of now-ubiquitous touch screen interface was put into words in October 1965, when Eric Arthur Johnson, an engineer at the Royal Radar Establishment in Malvern, England, interested in developing touchscreen for air traffic control, described his ideas for a capacitive touchscreen in a short 2-pages article in (Touch Display – A novel input/output device for computers, Electronics Letters, 1(8), 219-220). It was a device that uses wires, sensitive to fingers' touches, on the face of a cathode-ray tube on which the computer can write information. In 1967, E.A. Johnson published another more comprehensive paper on the topic (Touch Displays: A Programmed Man-Machine Interface, Ergonomics, 10(2), 271-277), explaining how the technology worked through diagrams and photographs of a prototype. Johnson was granted a US patent for his invention in 1969 (see the US patent 3482241). Created 1965 Creator E.A. Johnson Original Use For air traffic control Cost N/A In early 1972, a Danish engineer working in CERN, Bent Stumpe, was asked by Frank Beck, who was in charge of the central control hub in the Super Proton Synchrotron, SPS, control room, to build the hardware for an intelligent system which, in just three console units, would replace all those conventional buttons, switches, etc. In March 1972, after a few days, Stumpe presented a proposal to build a touch screen with a fixed number of programmable buttons. It also uses a tracker ball as a computer-controlled pointing device – something like a mouse – and a programmable knob. The first touchscreens were installed in 1973 and remained in operation until 2008. Bent Stumpe with a prototype of a touchscreen Touch Screen: How It Worked The touchscreen technology features three (3) major components: the touch sensor, controller, and software. The touch panel or sensor features a touch-responsive surface with the passage of electrical current. The voltage changes whenever the screen is touched, thereby signaling the touch location. Touchscreen systems are built on various types of sensors, including capacitive, resistive, and surface acoustic. Most touchscreens are capacitive. A touchscreen device The controller, hardware convert the voltage changes triggered on the touch panel into signals that your phone, computer, etc., can receive. The software receives such a signal, informing your device, whether phone, computer, etc., of the types of signals sent by the controller. In essence, the software tells you device what and where it is being touched, making it react accordingly. Touch Screen: Historical Significance Although introduced in 1965 by E.A. Johnson, touchscreens weren't commercialized until 1990 when Hewlett Packard, HP, introduced the HP-150, a computer featuring a 9-inch CRT display and infrared detectors used to detect any finger interactions with the device's screen. Also, in the early 1980s, Delco Electronics of General Motors replaced non-essential functions of automobiles, such as transmission, braking, steering, etc., with electro-mechanical systems. This resulted in the introduction of the Electronic Control Center, ECC, featuring various peripheral sensors, antenna, servos, and a monochrome CRT touchscreen used majorly for input and output. In 1982, the University of Toronto introduced Multi-Touch Technology. By 1985, they've invented a multi-touch tablet that uses capacitance. In 1987, Casio also made their Casio PB-100 pocket computer commercially available. The pocket computer featured a touchscreen with 16 touch areas on its Led-crystal Display, LCD, graphic screen. Ever since, touchscreen technology has experienced rapid growth and acceptance, particularly because of the ease of operation it offers users. The first touchscreen phone was made commercially available by IBM in 1993. What is a touch screen? A touchscreen allows users to interact with their devices using their fingers or stylus. The touchscreen technology is suitable and currently available on various devices, including laptops, computers, smartphones, cash registers, etc. Who invented the touch screen? E.A. Johnson When was the touch screen invented? 1965 Where was the first touch screen invented? The first touchscreen was invented Royal Radar Establishment in Malvern, United Kingdom. What was the first touch screen item? HP-150 computer. IBM also released the first touchscreen phone in 1993. How has the touch screen changed the world? Touchscreen technology has significantly revolutionized the computer industry, aiding the portability of digital devices, such as smartphones, tablets, etc. It also ensures user-friendliness and ease of using certain machines, such as car multimedia players, ATM machines, etc. How does a touch screen work? The touchscreen technology features three components, the touch sensor, the hardware (controller), and software. The touch sensor initiates a signal whenever a user interacts with the device's hardware. The hardware sends the signals to the software, where the device interprets and reacts accordingly. In our modern world, touchscreens are a common sight. According to a Pew Research survey conducted in November 2016, 77% of Americans own a smartphone and 51% own a tablet computer. While the touchscreen has been around for decades, it's never seen popularity like this. But where did they come from? How did they become so widespread? And how can we expect them to change? When compared to other computer devices, touchscreens are unique because they handle both input and output — interpreting the user's actions while featuring a graphic display. They allow the user to interact directly with what's on the screen, unlike a mouse that moves a cursor. Theoretically, this is a faster design because the pointer doesn't need to travel across the screen between different objects. Touchscreens can additionally come with a number of features that increase their functionality. Multi-touch – the screen can detect the presence of more than one point of contact for input. A "10-point" touchscreen will distinguish all ten of a person's fingers separately. Pressure sensitivity – the amount of pressure applied to the screen is also detected. This adds another layer of input and is used in the Apple Watch as Force Touch and 3D Touch in the iPhone 6S. Gesture recognition – the touchscreen recognizes certain finger motions as separate commands, such as double-tapping to select text or pinching to zoom out. Haptics – recreates the sense of touch with motion. In today's smartphones, it often refers to vibration generated when touching the screen. Fingerprint resistance – since most users will be using their fingers, newer screens are have oleophobic coating (Greek for "fear of oil") that prevents oils from sticking to the surface. The first touchscreen was invented in 1965 by Eric A. Johnson who worked at the Royal Radar Establishment in Malvern, England. His first article, "Touch display—a novel input/output device for computers" describes his work and features a diagram of the design. The invention is known as a capacitive touchscreen, which uses an insulator, in this case glass, coated with a transparent conductor, like indium tin oxide. The user's finger also acts as a conductor and disrupts the capacitance of the conducting layer. In more simple terms, touching the screen causes a change in the electric charge, but the computer detects. Johnson patented his design in 1966, improved it in 1968, and wrote another article in the same year. At some point, it was adopted by British air traffic controllers and was used into the 1990s. Another design came in the 1970s, with the resistive touchscreen. American inventor, scientist, health physicist, and educator Dr. G. Samuel Hurst discovered this design while studying atomic physics with a Van de Graaff generator, a machine that accumulates and releases electric charge. He and two colleagues used electrically conductive paper to read the coordinates of their analysis, completing their experiments in a few hours when it could have taken days. The University of Kentucky — that Hurst had been working at — tried to patent the idea on his behalf, but he had other ideas. When returned to work at the Oak Ridge National Laboratory, he dedicated time after-hours to work on his almost accidental invention. Hurst and nine others worked to perfect the design, calling their group "Elographics" while applying it to controlling computers. This design uses a number of thin resistive layers with thin gaps between. When a finger presses down on the screen, they're pushed together, creating voltage that a computer can read as a location. Because it uses pressure, it can be pressed with either a finger or stylus. In addition, the design is cheaper than a capacitive screen. 1980s: First Consumer Models and New Technologies Tech companies were starting to take notice of this new way to control computers. Hewlett-Packard was the first to release a product that put touchscreens in the hands of everyday users. HP made a name for itself in the 1960s and 70s for creating smaller and smaller computers to the point where it had made one of the first machines to be called a "personal computer", the 9100A. In 1983, Hewlett-Packard released the HP-150, also known as the HP Touchscreen. The included device used a new system for touch input, featuring a grid of infrared emitters and detectors in the monitor's bezel. When the infrared beams were interrupted, the HP-150 could locate where the user was touching the screen. However, the system had its faults: dust would get into the infrared holes and require vacuuming. The design wasn't ergonomic either, users would complain of muscle fatigue, or "Gorilla Arm" from keeping their arm outstretched and unsupported for long periods of time. This first foray into a consumer touchscreen device wasn't incredibly popular. When the HP Touchscreen II released in 1984, the touch screen was optional, and rarely added. Meanwhile, other touch technologies were being developed. Myron Krueger, an American computer artist developed the Video Place, a screen that could track a user's silhouette and movements. Multi-touch was also proven in 1982 at the University of Toronto by Nimish Mehta. This design also used a camera to identify where the user was touching the screen. The first multi-touch overlay was developed in 1984 by Bob Boie of Bell Labs, creating a true capacitive screen that could detect multiple points of contact. 1990s: Popular Touchscreens As computers continued to shrink, tech companies started seeing the possibilities of handheld devices. Apple released the MessagePad, also called the Newton, in 1993 as a revolutionary new tool: the PDA. These used a touchscreen that was made for a stylus, and boasted a much anticipated feature: handwriting recognition. However, the high price point and problems interpreting user writing kept it from being successful. At this time, IBM released the first cellphone with a touchscreen, the Simon Personal Communicator. Today, it's recognized as the first true smartphone with a calendar, address book, and notepad. The most popular series of touchscreen devices was the Pilot by Palm Computing. Introduced in 1996, these PDAs were a staple in the business world, improving on many of the Apple Newton's features. In fact, the Palm Pilot's handwriting recognition was so successful that it was eventually used on later models of the Newton. By the end of the 1990s, touchscreens became part of computer culture and interest increased. Wayne Westerman, a graduate student of the University of Delaware published a doctoral dissertation about capacitive touchscreens in 1999 that would lead to their popularity today. He also formed the company FingerWorks to create new devices based on his findings. 2000s: Pre-Smartphone Touchscreens in Daily Life Touch screens really started to enter the public eye in this decade. FingerWorks used its research to develop the first multi-touch gesture-based products. Most of these were computer accessories like keyboards with "zero-force" keys, exploring new methods of input. Much like the Apple Newton, these products were innovative, but expensive. Products such as the TouchStream LP, MacNTouch, and the iGesture Pad were well received, but did not see much use outside of users with disabilities. In 2005, FingerWorks announced they were no longer in business, but continued to file and process patents into 2007. The company was bought by multinational corporation that would be known for causing the success of touchscreens to skyrocket. Big tech companies continued to see how touchscreens could be used in new ways. Alias|Wavefront created the PortofolioWall, a gesture-based computer that made visual design a breeze. Nintendo released the first successful video game console with touch input in 2004, the DS. Microsoft began developing their own devices as well. The Microsoft Surface (not to be confused with today's line of tablets) was a computer the size table with a flat touchscreen display on top. Soon, ATMs, fitness machines, gas pumps, and checkout counters would feature this style of input as it grew in popularity. In 2007, the original iPhone was released and revolutionized the phone industry, featuring a touchscreen instead of a physical dialing pad. Smartphones became the number one device in communications and with them, this new style of input. The iPhone's touchscreen can change between a dialing pad, a keyboard, a video, a game, or a myriad of other apps. This was leaps and bounds ahead of the previous leader in phone technology, the BlackBerry, which featured a full physical keyboard. Remember, it was so popular that it was called the "crackberry" — it doesn't even compare to the addictiveness of smartphones today! The iPhone brought with it a capacitive touchscreen that included a brand-new feature for the consumer market: multi-touch. Apple claims it invented the technology, but in reality they purchased FingerWorks to assist in iPhone development and only popularized it. The multi-touch capabilities of the new smartphone added more functions than those found in single-touch devices. This is why Apple decided to use the more expensive capacitive screen. However, it relies on the electrical charge of human skin and cannot be used with a glove or a normal stylus. Today: Touchscreen Explosion The Apple iPad was released in 2010, creating another market for touchscreen devices. The first truly mainstream tablet was apparently worked on before iPhone, and its release touches on a speech made in 1983 by Steve Jobs: "What we want to do is we want to put an incredibly great computer in a book that you can carry around with you and learn how to use in 20 minutes ... and we really want to do it with a radio link in it so you don't have to hook up to anything and you're in communication with all of these larger databases and other computers." Just like the iPhone, the iPad created a wave of tablets from competitors. Not only are most of our phones equipped with touchscreens, but our portable computers are too. Touchscreens for Businesses Now that touchscreens are in the public consciousness, more and more businesses are using them to for connecting with customers. The easy-to-use design of tablets makes them perfect for featuring digital catalogs or self-checkout areas. Companies also bring them to trade shows, showing their portfolio to passersby that can browse at their own pace. Large touchscreen stands are another great promotional tool for businesses. These kiosks provide a large area that allow customers to browse through products, menu items, maps and more. These customizable digital displays make it easy for anyone to navigate through a business's presentation. The stands support up to ten points of contact and wireless connectivity, allowing companies to feature almost anything they want. \$2,500.99 \$942.99 \$1,175.99 \$894.99 We've come so far in creating new ways to interact with computers, what could possibly come next? One new development is right around the corner: flexible smartphones. Samsung has featured prototypes since 2013 of devices with a bending screen and there have been successive rumors over the years about an impending release. This design would be great for smartphones, which are often damaged from minor bends. However, it's difficult keeping all the different parts of the device in contact with each other when the case flexes. Samsung believes it will have the first flexible smartphone out in 2018, but the technology is still unproven. Touchscreen Anywhere Why limit the touch display to the device? Why not project the touchscreen onto any surface? OmniTouch attempts to accomplish this by with a projector that puts the display on walls, tables, books, and even on human skin while a camera detects the input. Imagine answering a text on your arm rather than having to pull out your phone! The model showed in 2011 by Chris Harrington was a shoulder-mounted wearable computer. The "always-available" surface has not seen much development in recent years, but it might make a comeback when technology catches up. After all, it took 24 years after the first smartphone was released before they became popular! Advanced Haptics What if we could feel the screen when we touch it? A touchscreen with advanced haptic technology could change to feel like different textures or feature physical bumps as buttons. This was demonstrated by Tanvas at the Consumer Electronics Show in 2017, featuring different types of fabric. Reporters say that the screen didn't magically feel like these textures, but they could definitely feel the difference between them. In time this could be one of the many features incorporated into smartphones! Ultrahaptics Put touch controls anywhere without being limited to a physical surface. In 2013, the company Ultrahaptics demonstrated ultrasonic sound waves that change air pressure and create interactive 3D objects. It sounds crazy, but it works. These controls are totally invisible but they can be felt and interacted with like a physical knob or lever. The ultrasound sensations won't create a wall that your hand couldn't move through, but you'd definitely be able to feel it. Ultrahaptics is looking to incorporate the technology in cars, giving drivers extra control without the need to look at a screen.







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