

**U-TECH 2023**

**UNDERSTANDING**

**TECHNOLOGY**

**2023**

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**UR-TECH INDUSTRIES**

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## 2. Introduction

Congratulations on purchasing this book, “Understanding Technology 2023 (U-TECH 2023).”

This book teaches you everything you need to know about technology from a novice to an intermediate user of technology.

In this book, we cover all aspects of computing technology and explain how modern technology devices work, as well as the history and the standards that they have emerged from. There is a dictionary (glossary) at the back section of this book, so that you can learn all of the words, acronyms and abbreviations used throughout this book and in the real world, so that you know what each part is for and how you use it.

This book allows you to understand what everything is for and which words to use, should you need to speak with a parts, sales or technical person when purchasing, replacing parts or fixing electronic equipment. UR-TECH provides you with the knowledge to be able to repair and manage devices

yourself, as well as know what to do should you need to replace something or upgrade it (usually to get something faster).

Since the industrial revolution, man has revelled in making and improving machines to make work for human beings much easier and faster. Production and efficiency have greatly increased, leading to greater profits and an increase in the standard of living for humanity.

Today, computers drive, operate and control so much machinery and equipment that we rely on them for daily living such that they've become a part of our lives. Technology is beneficial for our world, particularly in a world of change, where stability is an important factor in driving that change using innovation. Reliability of your favorite communication device, may rank as a top listing of importance for technological products of choice.

The speed of computers, driven by their microprocessor chips or 'chips,' as they're known in the I.T. (information technology) world, has exponentially (drastically) increased over the past 20 years. Chips along with hard drive and software speed improvements have enabled computers to operate much faster than what they were around the turn of the millennium (the year 2000).

Computer graphics have dramatically increased in quality, with near-real graphics now available, making for crisp visuals when watching movies and playing games.

Gamers (people who love playing games a lot) are enjoying better and better quality as time goes by and they now expect fast, high-quality graphics.

Since the year 2000, mobile phone technology has surged, with the number of phone models and apps (applications) flooding the modern world.

Competition among rival companies for the ultimate position of first place in sales across the world market has emerged. Legal challenges for technology ownership is a realistic part of life in the ever-evolving technology industry.

Some companies have had to pay others for using their technologies without permission, yet with the phones already distributed across the world, there really was no choice to turn back and instead, move ahead as customers continue to pursue their phone of choice, expecting newer models and local support for their already purchased model.

The market has developed into a buyers shopping paradise, as more and more phone models are released with increasing frequency, making the way for a buyer's market - a wide range, better performance and competitive pricing.

Desktop computers, then notebook computers and now smartphone devices are the most popular throughout our society in 2023. People have swapped their big, bulky and heavy computers for smaller handheld phones and tablets. No more messy cables, wires, computer housing cases, big monitors or 'screens,' just a small device that you can carry around with you.

Today, the technology is smaller and faster: less volume (size), less weight (lightweight) and higher speed. All of these factors mark and serve as an indicator how far we have progressed (moved forward) over the past 30 years.



The future is looking bright and positive, given the enormous improvements in technology generally, as a whole. Faster processors made of newer materials, cheaper storage, and newer technologies in human interaction such as speech recognition, biometrics improvements and human to machine instructions. Combining all of what we know and what we continue to invent and reveal to the world, is that technology helps us as human beings to repair and sustain health, by making our lives easier and sustaining health longer than 100 years ago.

From the time we wake up until the time we go to sleep, chances are that there will be some technological device there to assist you within your daily life.

Yes, there are ongoing security and privacy issues, however given the relatively short time since the inception of this new era, we have improved how we ‘patch up the holes,’ that we make as we evolve along the technology trail. Managing threats and removing risks is more important than ever before. One example is Play Protect, a Google Play Store service/feature which is basically in simple terms, a certification service to verify that the download on offer, has already been scanned/checked for viruses and/or malicious ware (malware) that could potentially infect and damage your device. New app game companies may be fraudulent in nature, by promising you earnings as real money, but then prompted to pay them around \$1 to receive the payout. Theoretically illegal, but not policed by Google.

Data transfer and management possibly remains one of the largest challenges in terms of keeping it under control and managed. As data became cheaper and storage volumes have increased which means that the need for greater speed of computers but also the transfer speed over a network – cable internet and mobile internet speeds are a limiting factor for people wishing to move files that have a large size.

Hence, the demand for faster data transfer inside (internal) a computer (or tablet and smartphone), outside (external) of a computer to another computer or device (by cable or via a local network) or outside of a computer via the internet to another computer or website.

The demand for speed and performance has increased massively, as consumers request tasks to be performed faster due to their increase in workload. Society is driving technology development through consumer requests. The world is now operating in a consumption environment where people are living longer, working more and doing more in and throughout their lives, so there are more modern digital tasks to be performed. Multi-tasking has become a requirement and machines have allowed this to be exploited as best as we can to enable simpler living on earth.

What does this mean? Well, simply put – faster machines to cope with larger operating systems (OS's), apps, storage and increased app features. All of these demand resources, which is driven by better hardware and software. Interface innovation may also have an impact on the development, as data speed transfer rates seem to be an ongoing issue. Too slow equals not fast enough and many people complain of this issue often, particularly when cables and wireless technologies such as Bluetooth, bottleneck or slow down the transfer speed rate in comparison to local speeds of the OS accessing the internal hard disk drive (HDD) or solid state drive (SSD).



The speed of the new chip driven solid state drives or SSD's, is now quite fast, however USB 3.0 is the bottleneck that slows down the data transfer speed rate, which frustrates consumers.

Firewire is faster than USB, but it never really became a commercial, standard connection option, so USB really stuck around based on popularity rather than speed superiority.

Hence there is room for a newer and faster universal connections to transfer data. Firewire could have been it, but was not adopted by manufacturers universally.

Wireless connections began to evolve into faster and faster data transfer rates. Terms such as Bluetooth, WiFi and HotSpot emerged onto the scene and made life far easier for people to use their devices, but at the same time faced security problems as the technologies emerged at the start, however improved towards the last decade of this century.

In the early days, connecting to the internet from a home or business computer was done using a dial-up modem, which would act similar to a fax, whereby the modem connected to the computer dials into another receiving modem using (over or via) the telephone line (cable) and is then authorised (authenticated) by software to be granted access to the internet by the ISP (Internet Service Provider). The last dial-up modems to be made and released were 56k modems. The 56k stood for (means) 56 kilobits per second (Kbits/s or Kbps), as the description of its transfer speed over a telephone line (cable or wire).

ISDN (Integrated Services Digital Network) was a high-speed transfer service, allowing for large files to be sent over telephone wires (cables or lines). ISDN was classified as the first type of 'broadband' internet. Broadband was born and evolved into what it is today – a high-speed internet network facility that could be accessed from any home, business or organisation.

Today, WiFi is now easier than ever to connect a technical device to, whether it be a notebook computer, a tablet, an iPad or a smartphone – the ability to 'get online' is now far easier and more secure than it was in the developing days. Although it has its limitations, WiFi has proven successful for the world because of the convenience it provides.

Artificial Intelligence (AI) coupled with robotics are paving the way for a smarter world.

We can look forward to more automated and self-governing AI, such that they are flooded with real-life situations that make AI more, 'human.'

AI has the capability to mimic and 'learn' human behaviour, thus it is possible for AI to self-govern itself as an individual.

### **3. The Basics**

Technology devices are divided into two (2) main categories:

1. Hardware; and
2. Software

### 3.1. **Hardware**

Hardware is the word used for any physical technology device, part or component. Basically, hardware is anything that you can physically touch or feel with your hands – a physical object.

Examples of computer and device hardware include: desktops , mini-towers, towers, servers, racks, mini-computers, notebooks (laptops), gaming consoles (Sony PlayStation, Microsoft Xbox), memory chips, main boards, monitors/displays, cameras, batteries, SD cards, micro SD cards, USB memory drives, cables, routers, WiFi modem routers, smartphones, printers, ink, keyboard and mice (plural of a mouse).

### 3.2. **Software**

Software is the word used for any virtual environment that you can see on your hardware – much like watching a movie on TV. The TV is the hardware (something you can touch) and the movie is the software (something you can view/see, but cannot physically touch).

The main types of software are:

1. Operating Systems (OS's);
  - 1.1. Microsoft Windows (desktop, server and tablet)
  - 1.2. Apple Macintosh OS (desktop computer, server)
  - 1.3. Apple iOS (iPhone and iPad)
  - 1.4. Android (smartphone and Tablet)
  - 1.5. Linux (desktop computer, server, webserver, Android)
2. Applications (apps)/programs; and
3. Firmware

The **operating system** (OS) operates the computer or device, usually visible or visually seen and accessible in the form of a visual virtual environment viewed upon a graphical user interface (GUI) such as a display (monitor, screen or a TV).

**Applications** are software programs that are pre-installed and can also be installed by the user (any person who uses the computer or device).

**Firmware** is software that is installed into a ROM (read-only memory) microprocessor chip.

Firmware can be upgraded by downloading it from the device manufacturer's website and installing it.

### **3.3. How Hardware and Software work together**

Since the last half of the past century, operating systems have annexed computer hardware to work together as one which are the two main components that make up the computer. In other words, a computer is made of the physical parts which are controlled by the operating system. The operating system uses the computer hardware parts to follow instructions and execute commands that perform software (app) operations. This means, that the operating system is built of apps (also known as applications or programs on some operating systems or devices).

From the early days of IBM (International Business Machines) mainframes during the 1950's, to Apple's iOS and Google's Android in 2023, the operating system has transformed society into a brilliant new way of being able to perform human tasks used in our daily living and for productivity. Hardware and software have developed together in parallel, with manufacturers having to understand each others' products.

Generally, software should be matched to hardware capabilities. In other words, if you use an old OS such as Windows 95 to control a new computer, there may be problems with both installation of the OS or operation of both the OS and the hardware (the computer itself).

#### **Technical Talk**

Hardware is powered by either mains electrical power or battery. The software then controls and uses (operates) the hardware to perform functions or tasks that the user instructs to the machine hardware and pre-installed apps (apps that were already installed) or post-installed apps (apps that the user has installed) to then perform individual software tasks such as open a folder, read the contents of a USB memory drive, perform a function or send an email.

Software generally controls hardware on any technological device and connect to software as well as hardware, regardless of operating system used. Older systems were usually only operating one function at a time, so back then things were quite simple. Today, software performs tasks at fractions of a second.

Software and hardware work together in tandem to follow instructions from the CPU via the user or other machine(s).

Commands are directed by the user to the computer which performs the tasks required.

All contents of the OS (Operating System) and the user's documents, music, pictures and videos etc., are stored on a storage device, also known as a hard disk, disk drive, solid state drive or memory device (such as a USB drive, also known as a thumb drive or memory stick). The first discs before hard disk drives were floppy disks. Like hard disk drives which have a round disc that physically spin, data is magnetically stored onto the disks as bytes with allocated addresses (locations) by the OS.

### 3.4. Bits and Bytes

A *bit* is a **binary digit**. It is in the format as either a number 1 (one) or a 0 (zero). They are called *bits*. If it is represented as a 1, its command is either ON, YES or TRUE. If it is represented as a 0, it is either OFF, NO or FALSE. Electricity from the computer is released if it is a binary digit (bit) which equals 1, to turn on a device or part in your computer using transistors. This is called Boolean Logic. Logic gates are transistors which allow or restrict the flow of electricity to other transistors and to the rest of the computer or device. Each transistor has different properties that can change the state of each binary digit. These are represented in what are known as *Truth Tables* (a table of zeros and ones). A *byte* is 8 bits (8 x bits). This is how memory chunks are used in computers: bytes. Every microprocessor (or microchip) has millions, billions or even trillions of transistors, allowing the OS to process calculations and perform actions or tasks at high speeds.

Bits and bytes are data, stored by the computer on a hard drive, in memory, on an external device such as a USB memory stick or drive, MicroSD card for smartphones and computers; and on a DVD disc. The operating system organises and stores bytes at allocated addresses.

### 3.5. Storage, Memory and Optical Drives

The two types of memory/storage are **ROM** (Read Only Memory - a DVD, or USB Read-Only Installer Disk) and **RAM** (Random Access Memory) such as a DDR3 RAM CHIP, which is accessible by the device via the user. RAM disks are readable and writable (RW). You can only read data or information from a ROM disk or drive, however with a RAM disk you can read and write data or information to these devices. Read means that you can view or copy data or information from a ROM disk but you cannot edit or paste data or information to a ROM disk. So, on a RAM drive, you can read, write, copy, paste and edit files, pictures, audio or video – basically any type of file.

Examples of RAM disks include: hard disk drives, solid state drives, USB drives and DDR3 RAM (memory chips).

Some DVD's are readable, writable (R) and re-writable (RW), which means that they are very versatile (useful or handy) for many situations. DVD±R is a DVD that can be only written (burnt) once. The term 'burn a disc,' or 'burn a DVD,' mean to write some data, files, documents, music or videos to disc.

DVD±R is a DVD disc that can be written only once. This means that you can burn files to disc or copy another disc to this disc, but you can only do it one time and cannot delete/erase the contents of the disc.

DVD±RW is a DVD disc that can be rewritten as many times as you want. This means that you can copy files to a disc and erase them. Basically, it means you can use the DVD as a storage disc to add or remove copies of your files from your computer or change the disc however you would like to use it. Therefore, you can erase/delete everything on the DVD and then copy new files onto the disc.

ROM = Read Only Memory (readable but not writable storage space, such as internal memory, a CD ROM or a DVD ROM)

RAM = Random Access Memory (readable and writable storage space, such as a hard disk drive, solid state drive, USB drive or writable DVD disk)

**Table: Optical Disc media from the past and present.**

MEDIA	TECHNICAL NAME AND CAPABILITIES
CD	Compact Disc; can write data only once; store up to 700MB of data
CD-R	Compact Disc Recordable; can write data more than one time but cannot delete data (data can only be added until the disc is full)
CD-RW	Compact Disc Rewritable; can write and erase (delete) data as often as you like!
DVD	Digital Video Disc; store from 4.7 – 17GB of data
DVD-R	Digital Video Disc Recordable; can write data more than one time but cannot delete data (data can only be added until the disc is full)
DVD-RW	Digital Video Disc Rewritable; can write and erase (delete) data as often as you like!
Blu-ray	Blu-ray Disc; store up to 50GB of data such as movies

Computers are now an important part of most businesses everyday across our world, increasing productivity and improving lives. Home and work use of computers has made our lives easier.

Stable functioning software is the objective of every software developer, although due to budget or human resource issues, apps may be released containing bugs, making the user experience from non-functional at all to working with errors or frozen states, potentially deeming them unusable. These are commonly known as ‘bugs.’

Even with apps from large companies, there may be a software ‘patch’ update release for the OS or program that you have installed on your machine or device. Most of the time it should improve interoperability, performance or add new features to an app or OS, however in some instances there may appear to be no difference at all. ‘Bugs,’ are found in software, which causes a problem for users, where some type of error or the software freezes and the computer may need to be restarted.

### 3.5.1. Hard disk drives and SSD's:

Hard Disk Drives and Solid State Drives have been the storage capacity devices which have had and continue to offer enormous success across the world in millions of computers and other smart devices. Smartphones all use SSD's – basically, they are all just 1 big microchip processor and one memory chip, which is where everything is stored and runs, or **operates** as fed into by the OS, via user input. The days of moving parts have gone. Electric has taken over mechanical!

## 4. Operating Systems

The first operating system was developed in 1956, by General Motors ([https://en.wikipedia.org/wiki/History\\_of\\_operating\\_systems](https://en.wikipedia.org/wiki/History_of_operating_systems)).

It was called a mainframe, because of the big cabinet casing that housed the computer.

It consisted of a CPU (Central Processing Unit) and memory. IBM were next on the scene and developed their own mainframe operating systems. Operating systems would develop at an ever expanding rate up until the present day.

From big to small, they have massively reduced in size over the past 66 years of development.

People are more reliant on technology than ever, driving big business even bigger, employing more people, helping lives on a daily basis and assisting the future development of new human technologies for use here on earth and in other areas of the universe.

OS's have hugely developed during the past 60+ years, but today the variety is far greater than yesteryear with business and home consumers benefiting on a higher level compared to at the beginning, when they first appeared on the market, for sale to customers.

The two (2) main types of operating systems for all-in-one's, desktops, notebooks and servers are:

1. Commercial (Paid); and
2. Open-Source (Free)

Here is a list of the most popular operating systems used today:

1. Unix (Paid)
2. Linux (Free)
3. MS-DOS (Paid)
4. Mac-OS or iOS (Paid)

5. Windows (Paid)
6. Android OS (Paid for when purchasing the device)
7. Chrome OS (Paid for when purchasing the device)
8. FreeBSD (Free)
9. OpenBSD (Free)

There are many operating systems to choose from today.

Technology is far more compatible than what it was 25 years ago, so it is possible to install and operate OS's onto computers built or designed and recommended for a different OS originally.

For example, it is possible to install a Linux OS distribution onto an Intel processor mainboard system, designed for Microsoft (MS) Windows.

Let's take a look at these popular operating systems from the past up unto today:

1. Unix: Unix was developed as a commercial (paid) software product for sale back in the 1970's and was sold to and bought by various companies and groups. Today, Unix is owned by Novell. Unix is traditionally a command-line OS, with no GUI (Graphical User Interface), just white or green text on a screen. It's filesystem is based on a hierarchy standard, which utilises a non-GUI directory structure, similar to GUI desktop systems such as MacOS and Linux. Microsoft Windows uses a different type of filesystem hierarchy structure (see Filesystems below in Section 3.1).

[https://en.wikipedia.org/wiki/Filesystem\\_Hierarchy\\_Standard](https://en.wikipedia.org/wiki/Filesystem_Hierarchy_Standard)

1.1. <https://en.wikipedia.org/wiki/Unix>

<https://en.wikipedia.org/wiki/OpenSolaris>

2. Linux: Linux was invented in 1991 and today hosts the most number of internet web servers in the world, such as Apache. Linux is the graphical user interface (GUI) version of Unix. This means that it can be seen visually the same as the 'windows' style of desktop operating systems. It is fast and secure like Unix. Linux comes in many flavours, which means that it is made by different manufacturers with different models. There are so many Linux distributions. Below are listed the most popular Linux OS distributions.

2.1. CentOS

2.2. Chrome OS

2.3. Debian



- 2.4. Debian Edu
- 2.5. Fedora
- 2.6. Kali
- 2.7. Linux Mint
- 2.8. Novell Open Enterprise Server
- 2.9. Oracle Linux
- 2.10. Red Hat Enterprise Linux
- 2.11. Red Hat Linux
- 2.12. SUSE Linux Enterprise
- 2.13. Tails
- 2.14. Ubuntu (Ubuntu comes in many flavours)  
<https://ubuntu.com/desktop/flavours>

2.14.1. Kubuntu (Plasma desktop with office suite applications)

2.14.2. Lubuntu (Simple and easy to use)

2.14.3. Ubuntu Budgie (Modern and fast)

2.14.4. Ubuntu Kylin (Chinese)

2.14.5. Ubuntu Mate (Traditional)

2.14.6. Ubuntu Studio (Music, Video, Graphics, Multimedia)

2.14.7. Xubuntu (Lightweight and stable)

2.14.8. Ubuntu Unity (Beautiful design)

- 3. MS-DOS: Microsoft (MS) Disk Operating System (DOS) was introduced commercially in 1981 and finished public releases of its OS in the year 2000. It is incorporated into their main commercially selling product, Microsoft Windows.
- 4. Microsoft Windows for desktop and Windows phone.
- 5. Apple MacOS for desktop and iOS for Apple iPhone smartphones and iPads.
- 6. Google Android for tablet, TV and smartphone.

Terminals: all of these OS's used terminal applications, to write to the *kernel* (to program the computer). The kernel is the main part of the OS, which interacts with and controls: the CPU, memory, devices and applications (hardware and software). MS-DOS itself can be categorised as a terminal emulator which runs inside of the Microsoft Windows Operating System.

## 4.1. Filesystems

Filesystems are made of a directory structure, which means that for both non-GUI systems such as Unix and GUI systems, they are designed to be just like a physical filing cabinet from the days before computers. They include the filing cabinet (the root directory or base drive), which contain folders and then inside the folders, files are contained (stored or placed).

Basically filesystems are either:

1. Non-GUI (lines of code with no visual graphics such as Linux); or
2. GUI (visual graphics such as Windows, MacOS and Linux)

See the link below for all of the filesystems available.

[https://en.wikipedia.org/wiki/File\\_system](https://en.wikipedia.org/wiki/File_system)

## 4.2. The Desktop

The desktop is a hierarchical filing and management GUI (Graphical User Interface) system which allows users to organise in order, files and folders with the freedom of movement of those virtual objects. It is a visual stepping stone into the virtual graphical world of digital electronic data management and is used across the world on desktops, servers, tablets and smartphones. It is the same style of management system, spread across a spectrum of operating systems. It powers most modern machinery.

List of Operating Systems: [https://en.wikipedia.org/wiki/List\\_of\\_operating\\_systems](https://en.wikipedia.org/wiki/List_of_operating_systems)

## 4.3. The First Desktop Operating Systems with folders

The first desktop operating systems with folders was the 'oN-Line System,' (NLS), developed by Douglas Engelbart, in the 1960's at the Stanford Research Institute, USA.

It was further developed by Xerox and then Apple Computers. The Macintosh computer proved a hit, followed by Microsoft Windows.

Linux was developed later, in 1991 and became the GUI (Graphical User Interface) for Unix operating systems..

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