HARDWARE AND NETWORKING SERVICE LEVEL – I

Based on March 2022, Curriculum Version 1



Module Title: Connecting Internal Hardware Component

Module code: EIS HNS2 10 1221

Nominal duration: 40 Hour

Prepared by: Ministry of Labor and Skill

August, 2022

Addis Ababa, Ethiopia

Contents

Acknowledgment 4
Acronym 5
Introduction to the Module 6
Unit One: Identify And Categorize Internal Hardware Components 7
1.1 Identify and categories the different internal hardware components 8
1.2 Explain purpose and characteristics of internal hardware component 12
1.2.1 Identify the names, purposes, and characteristics of motherboards. 12
1.2.2 Identify the Names, Purposes, and Characteristics of CPUs 14
1.2.3 Identify the Names, Purposes, and Characteristics of Cooling Systems 14
1.2.4 Identify the Names, Purposes, and Characteristics of ROM and RAM 15
1.2.5 Identify the Names, Purposes, and Characteristics of Adapter Cards 17
1.2.6 Identify the Names, Purposes, and Characteristics of Storage Drives 18
1.2.7 Identify the Names, Purposes, and Characteristics of Internal Cables 18
1.2.8 Identify the Names, Purposes, and Characteristics of Ports and Cables 19
Selfi_check_1 24
Operation Sheet_1 25
Unit Two: Determine internal hardware components 28
User Internal Hardware Component 29
Self check-1 33
Unit Three: Obtain Equipment 34
2.2.1. Self-Check 1 39
UNIT FOUR: INSTALL COMPONENTS 40
4.1. Computer Components 42
4.2. Open the Case 43
4.3. Install the Power Supply 43
4.4. Attach Components to the Motherboard 43
4.5. The Motherboard 44
4.6. Install Internal Drives 45
4.7. Install Drives in External Bays 45
4.8. Install Adapter Cards 45
4.9. Connect Internal Cables 46

4.10. Complete Physical Installation 46
4.11. Boot Computer for the First Time 47
Operation Sheet-1 49
LAP Test 51
Unit Five: Evaluate modified system 52
5.1. Collect client or user feedback and analyze against client requirements 53
What is customer feedback? 53
Why is customer feedback so important? 53
The six rules for collecting better customer feedback 53
2.2.1. 1. The type of customer giving the feedback matters 53
2.2.2. 2. Whether it's prompted or unprompted, customer feedback matters 53
2.2.3. 3. The customer's motivations matter 54
2.2.4. 4. Volume matters 55
2.2.5. 5. Repetition matters 55
2.2.6. 6. The stakes matter 56
How to collect customer feedback? 57
2.2.7. Chat 57
2.2.8. Short surveys 57
2.2.9. Social media 57
Seven steps on how to analyze customer feedback:- 57
2.2.10. 1. Collate your data 58
2.2.11. 2. Determine how to categorize the feedback 58
2.2.12. 3. Get a quick overview 59
2.2.13. 4. Code the feedback 59
2.2.14. 5. Refine your coding 60
2.2.15. 6. Calculate how popular each code is 60
2.2.16. One super simple way to do this is to sort the data in your "feedback type", "feedback theme" and "feedback code" columns alphabetically, which will group similar items together. Then highlight all cells that have the same feedback code and a total count will appear in the right-hand corner of your spreadsheet. 60
2.2.17. 7. Summarize and share 60

Acknowledgment

Ministry of Labor and Skills wish to extend thanks and appreciation to the many representatives of TVET instructors and respective industry experts who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

Acronym

ISA - Industry Standard Architecture

EISA - Extended Industry Standard Architecture

MCA - Micro Channel Architecture

VESA - Video Electronics Standards Association

PCI - Peripheral Component Interconnect

PCMCIA - Personal Computer Memory Card Industry Association (Also called PC bus)

AGP - Accelerated Graphics Port

SCSI - Small Computer Systems Interface

Introduction to the Module

In Hard Ware and network Servicing filed; knowing and identifying the hard ware Components is the primary activity to categorize the input devices, output devices and secondary storage devices with their perspective ports and connectors.

This module is designed to meet the industry requirement under the Hard ware and Network Servicing occupational standard, particularly for the unit of competency: **Connect Internal Hardware Component**

This module covers the units :

- Identify Categorize Internal Hardware Components
- Determine Internal Hardware Components
- Obtain Equipment
- Installing hardware Components
- Evaluate modified system

Learning Objective of the Module

- purpose and characteristics of internal hardware component
- User Internal hardware component
- Obtain technical specifications for the proposed components
- Install hardware components
- Identify collection of client or user feedback and analyze requirements

Module Instruction

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” giver at the end of each unit and

Read the identified reference book for Examples and exercise

Unit One: Identify And Categorize Internal Hardware Components

This unit to provide you the necessary information regarding the following content coverage and topics:

- Identifying internal hardware components
- Explaining purpose and characteristics of internal hardware component

This guide will also assist you to attain the learning outcomes stated above. Specifically, upon completion of this learning guide, you will be able to:

- Identify and categories the different internal hardware components
- purpose and characteristics of the internal hardware component

1.1 Identify and categories the different internal hardware components

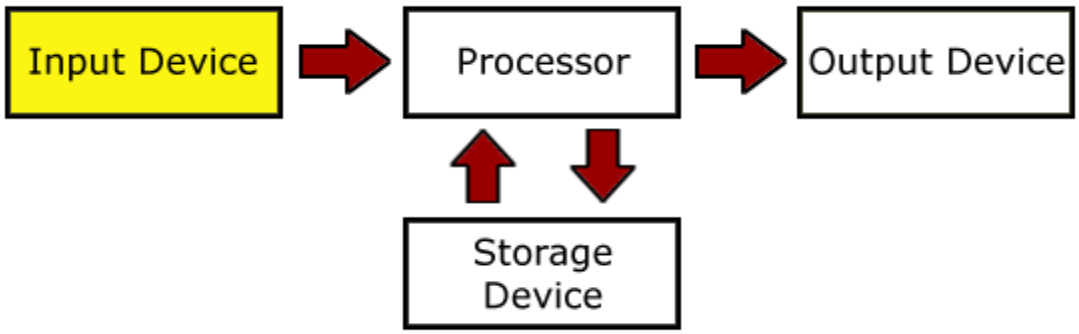
Components in computer systems are continually being refined and improved. At the time of writing this unit the following types of hardware components may be found internally in a computer:

Computer hardware is the collection of physical elements that constitute a computer system.

Computer hardware refers to the physical parts or components of a computer such as monitor, keyboard, Computer data storage, hard drive disk, mouse, system unit (graphic cards, sound cards, memory, motherboard and chips), etc. all of which are physical objects that you can actually touch.

Hardware components are classified into following categories:

- Input Devices
- Output Devices
- Storage Devices
- Processing



Input Device	• Allows you to enter data and instructions into a computer
Output Device	• Hardware component that conveys information to one or more people
System Unit	• Case that contains the electronic components of the computer that are used to process data
Storage Device	• Holds data, instructions, and information for future use
Communications Device	• Enables a computer to send and receive data, instructions, and information to and from one or more computers or mobile devices

The major component of a computer

- ✓ adapter cards
- ✓ cooling systems
- ✓ cpu components & features
- ✓ display device components
- ✓ memory component and features
- ✓ motherboard components
- ✓ power supply components
- ✓ Storage devices

1. **Adapter card** a printed circuit card required to allow a computer to support a new device or unicate with a peripheral; also called controller card.





Author/ opyright

The Processor (CPU)

3. cooling systems

Typical cooling mechanism

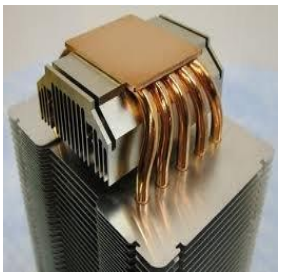
CPU and case Fans

- A **computer fan** is any fan inside, or attached to, a computer case used for active cooling, and may refer to fans that draw cooler air into the case from the outside, expel warm air from inside, or move air across a heat sink to cool a particular component.

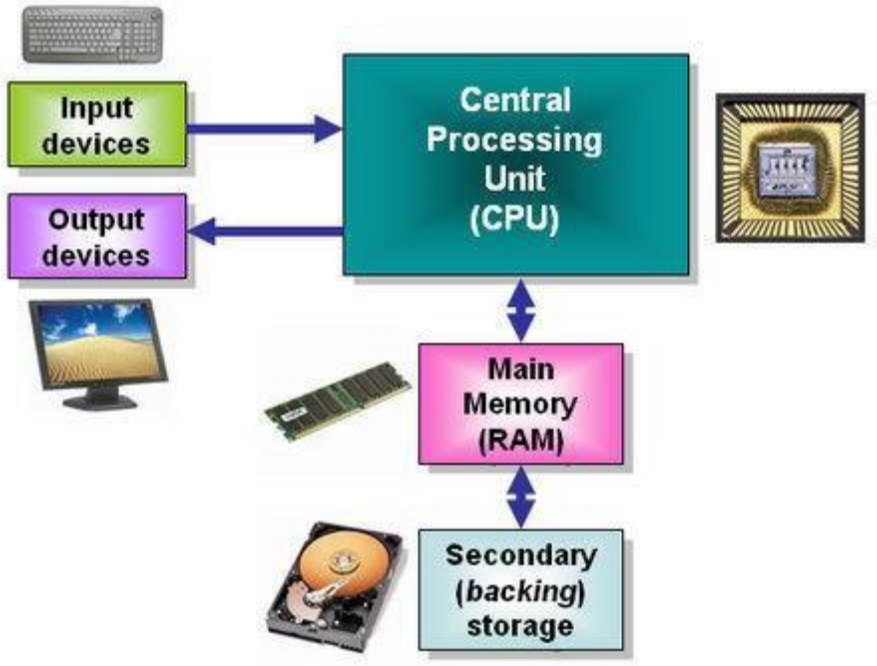
Heat sinks

- component that absorbs heat and cools a device by driving away heat into the surrounding air.
- Common type of heat sink used with CPUs is cooling fins.
- In computers, heat sinks are used to cool central processing units or graphics processors





A processor is an **integrated circuit** (IC) supplied on a single silicon chip. All of the components and pathways necessary for the movement of data around the processor are etched on this single chip.



Memory consists of electronic components that store instructions waiting to be executed by the

processor, data needed by those instructions, and the results of processing the data.

Stores three basic categories of items:

- ü The operating system and other system software
- ü Application programs
- ü Data being processed and the resulting information

The internal hard drive is the computer's main memory; this is where the **applications software**, disk **operating system** and **data files** are stored. The main advantage of these memories is the fast data transfer/access times and their large capacity to store data

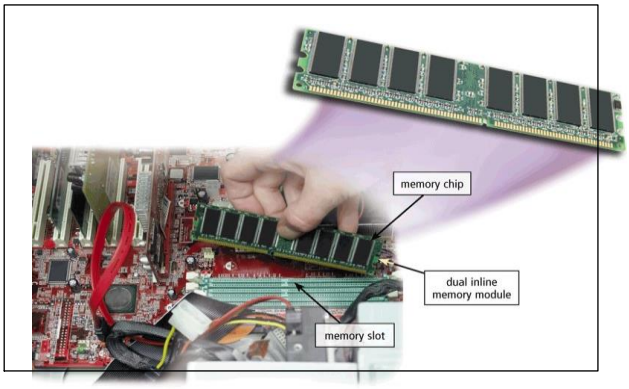
Main/Internal memory (including ROM and RAM)

This is the type of memory that can be read from and written to by the processor and other devices. Programs and data are loaded into RAM from storage devices such as a hard disk and remain in the RAM as long as the computer has continuous power.

The system unit contains two types of memory:

Random access memory (RAM) is an internal chip where data is temporarily stored when running applications. This memory can be written to and read from. Since its contents are lost when power to the computer is turned off, it is often referred to as a **'volatile' or 'temporary' memory**.

RAM chips usually reside on a **memory module** and are inserted into **memory slots**



There are Two Basic types of RAM chips exist:

- **Static RAM (SRAM) :** SRAM retains its contents as long as the power is connected and is easy to interface to but uses six transistors per bit.
- **Dynamic RAM (DRAM)** Dynamic RAM is more complicated to interface to and

- ✓ Identify the names, purposes, and characteristics of motherboards.
- ✓ Identify the names, purposes, and characteristics of CPUs.
- ✓ Identify the names, purposes, and characteristics of cooling systems.
- ✓ Identify the names, purposes, and characteristics of ROM and RAM.
- ✓ Identify the names, purposes, and characteristics of adapter cards.
- ✓ Identify the names, purposes, and characteristics of storage drives.
- ✓ Identify the names, purposes, and characteristics of internal cables

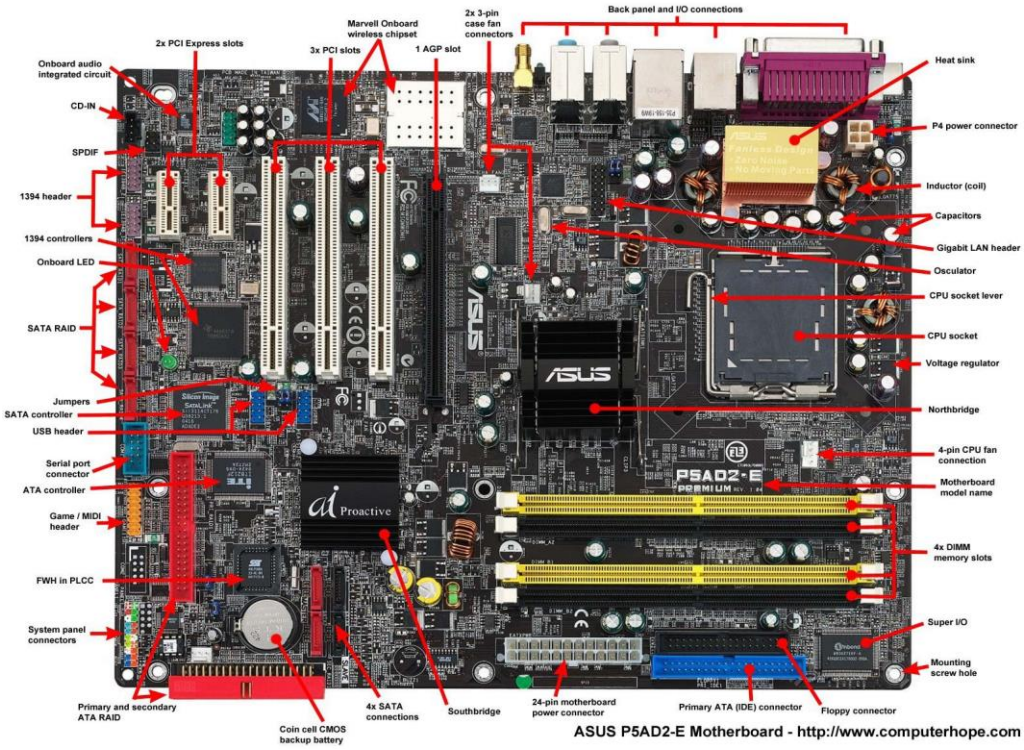
1.2 Explain purpose and characteristics of internal hardware component

1.2.1 Identify the names, purposes, and characteristics of motherboards.

A motherboard is also known as the system board ,backplane, or main board. Figure 1-4 shows

a variety of motherboards.

The motherboard accommodates the central processing unit (CPU), RAM, expansion slots, heat sink/fan assembly, BIOS chip, chip set, and the embedded wires that interconnect the motherboard components. Sockets, internal and external connectors, and various ports are

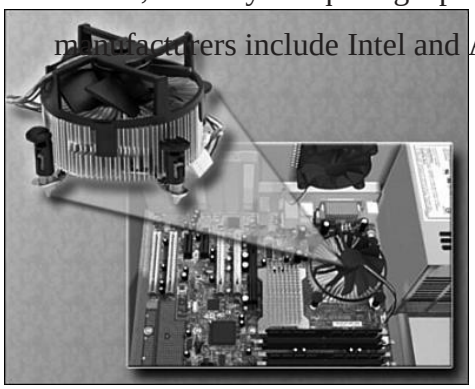


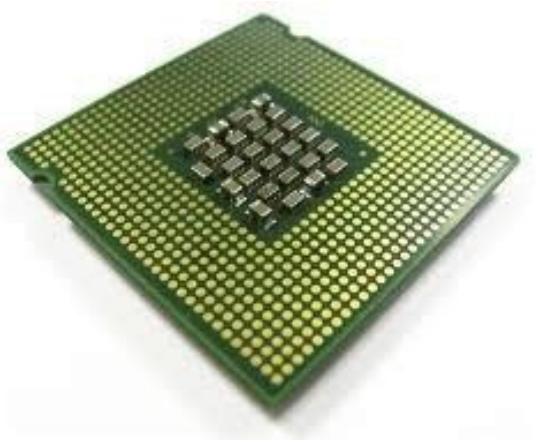
The form factor of motherboards pertains to the board's size and shape. It also describes the physical layout of the different components and devices on the motherboard. Motherboards have various form factors:

- Advanced Technology (AT)
- Advanced Technology Extended (ATX)
- Smaller footprint than Advanced Technology Extended (Mini-ATX)
- Smaller footprint than Advanced Technology Extended (Micro-ATX)
- Low-Profile Extended (LPX)
- New Low-Profile Extended (NLX)
- Balanced technology Extended (BTX)

1.2.2 Identify the Names, Purposes, and Characteristics of CPUs

The ***central processing unit (CPU)***is considered the computer's brain. It is sometimes called the processor. Most calculations take place in the CPU. In terms of computing power, the CPU is the most important element of a computer system. CPUs come in different form factors, each style requiring a particular slot or socket on the motherboard. Common CPU manufacturers include Intel and AMD.





1.2.3 Identify the Names, Purposes, and Characteristics of Cooling Systems

Electronic components generate heat. Heat is caused by the flow of current within the components. Computer components perform better when kept cool. If the heat is not removed, the computer may run slower. If too much heat builds up, computer components can be damaged. Increasing the air flow in the computer case allows more heat to be removed. A case fan, shown in Figure , is installed in the computer case to make the cooling process more efficient.





1.2.4 Identify the Names, Purposes, and Characteristics of ROM and RAM

ROM and RAM provide memory for a vast amount of computer equipment. They come in different memory sizes and module sizes and have different features. The following sections cover ROM and RAM in greater detail.

ROM

Read-only memory (ROM)chips are located on the motherboard. ROM chips contain instructions that the CPU can access directly. ROM stores basic instructions for booting the computer and loading the operating system.

ROM chips retain their contents even when the computer is powered down. The contents cannot be erased, changed, or rewritten by normal means. ROM types include the following:

- ***Programmable read-only memory (PROM)*:** Information is written to a PROM chip after it is manufactured. A PROM chip cannot be erased or rewritten.
- ***Erasable programmable read-only memory (EPROM)*:** Information is written to an EPROM chip after it is manufactured. An EPROM chip can be erased with exposure to UV light. Special equipment is required.
- ***Electrically erasable programmable read-only memory (EEPROM)*:** Information is written to an EEPROM chip after it is manufactured. EEPROM chips are also called flash ROMs. An EEPROM chip can be erased and rewritten without removing the chip from the computer.

Note

ROM is sometimes called firmware. This is misleading, because firmware is actually the software

that is stored in a ROM chip.

RAM

Random-access memory (RAM)is the temporary storage for data and programs that are being accessed by the CPU. RAM is volatile memory, which means that the contents are erased when the computer is powered off. The more RAM in a computer, the more capacity the

computer has to hold and process large programs and files, as well as enhance system performance.

The different types of RAM are as follows:

- ***Dynamic RAM (DRAM)***is a memory chip that is used as main memory. DRAM must be constantly refreshed with pulses of electricity to maintain the data stored in the chip.
- ***Static RAM (SRAM)*** is a memory chip that is used as cache memory. SRAM is much faster than DRAM and does not have to be refreshed as often.
- ***Extended Data Out (EDO)*** RAM is memory that overlaps consecutive data accesses. This speeds up the access time to retrieve data from memory, because the CPU does not have to wait for one data access cycle to end before another data access cycle begins.

- ***Synchronous DRAM (SDRAM)*** is DRAM that operates in synchronization with the memory bus. The memory bus is the data path between the CPU and the main memory.
- ***Double Data Rate (DDR) SDRAM is*** memory that transfers data twice as fast as SDRAM. DDR SDRAM increases performance by transferring data twice per cycle.
- ***Double Data Rate 2 (DDR2) SDRAM is*** faster than DDR-SDRAM memory. DDR2 SDRAM improves performance over DDR SDRAM by decreasing noise and crosstalk between the signal wires.
- ***RAMBus DRAM (RDRAM)*** is a memory chip that was developed to communicate at very high rates of speed. RDRAM chips are not commonly used.

Memory Modules

Early computers had RAM installed on the motherboard as individual chips. These individual memory chips, called dual inline package (DIP) chips, were difficult to install and often became loose on the motherboard. To solve this problem, designers soldered the memory chips on a special circuit board called a memory module.

The different types of memory modules are as follows:

- **Dual Inline Package (DIP)** is an individual memory chip. A DIP had dual rows of pins used to attach it to the motherboard.
- **Single Inline Memory Module (SIMM)**is a small circuit board that holds several memory chips. SIMMs have 30-pin and 72-pin configurations.

- **Dual Inline Memory Module (DIMM)** is a circuit board that holds SDRAM, DDR SDRAM, and DDR2 SDRAM chips. There are 168-pin SDRAM DIMMs, 184-pin DDR DIMMs, and 240-pin DDR2 DIMMs.
- **RAM Bus Inline Memory Module (RIMM)** is a circuit board that holds RDRAM chips. A typical RIMM has a 184-pin configuration.

1.2.5 Identify the Names, Purposes, and Characteristics of Adapter Cards

Adapter cards increase a computer's functionality by adding controllers for specific devices or by replacing malfunctioning ports. Figure 1-8 shows several types of adapter cards.

Adapter cards are used to expand and customize the computer's capability:

- **NIC** connects a computer to a network using a network cable.
- **Wireless NIC** connects a computer to a network using radio frequencies.
- **Sound adapter** provides audio capability.
- **Video adapter** provides graphic capability.
- **Modem adapter** connects a computer to the Internet using a phone line.
- **SCSI adapter** connects SCSI devices, such as hard drives or tape drives, to a computer.
- **USB port** connects a computer to peripheral devices.
- **Parallel port** connects a computer to peripheral devices.
- **Serial port** connects a computer to peripheral devices.

Computers have expansion slots on the motherboard to install adapter cards. The type of adapter card connector must match the expansion slot.

- **Industry Standard Architecture (ISA)** is an 8-bit or 16-bit expansion slot. This is older technology and is seldom used.
- **Extended Industry Standard Architecture (EISA)** is a 32-bit expansion slot. This is older technology and is seldom used.
- **Microchannel Architecture (MCA)** is an IBM-proprietary 32-bit expansion slot. This is older technology and is seldom used.
- **Peripheral Component Interconnect (PCI)** is a 32-bit or 64-bit expansion slot. PCI is the standard slot currently used in most computers.
- **Advanced Graphics Port (AGP)** is a 32-bit expansion slot. AGP is designed for video adapters.
- **PCI-Express** is a serial bus expansion slot. PCI-Express is backward-compatible with PCI slots. PCI-Express has x1, x4, x8, x16 slots.

1.2.6 Identify the Names, Purposes, and Characteristics of Storage Drives

A storage drive reads or writes information to magnetic or optical storage media. It can be used to store data permanently or to retrieve information from a media disk. Storage drives can be installed inside the computer case, such as a hard drive. For portability, some storage drives can connect to the computer using a USB port, a FireWire port, or a SCSI port.

These portable storage drives are sometimes called removable drives and can be used on multiple computers.

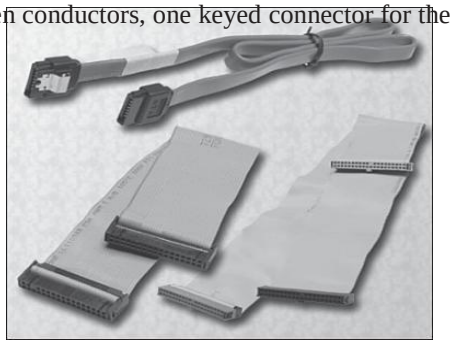
- Floppy drive
- Hard drive
- Optical drive
- Flash drive
- Network drive

1.2.7 Identify the Names, Purposes, and Characteristics of Internal Cables

Drives require both a power cable and a data cable. A power supply has a SATA power connector for SATA drives, a Molex power connector for PATA drives, and a Berg four-pin connector for floppy drives. The buttons and the LED lights on the front of the case connect to the motherboard with the front panel cables.

Data cables connect drives to the drive controller, which is located on an adapter card or the motherboard. Some common types of data cables are as follows:

- Floppy disk drive (FDD) data cable has up to two 34-pin drive connectors and one 34- pin connector for the drive controller.
- ✓ PATA (IDE) data cable has 40 conductors, up to two 40-pin connectors for drives, and one 40-pin connector for the drive controller.
- ✓ PATA (EIDE) data cable has 80 conductors, up to two 40-pin connectors for drives, and one 40-pin connector for the drive controller.
- ✓ SATA data cable has seven conductors, one keyed connector for the drive, and onekeyed connector the drive controller.



1.2.8 Identify the Names, Purposes, and Characteristics of Ports and Cables

I/O ports on a computer connect peripheral devices, such as printers, scanners, and portable drives. The following ports and cables are commonly used:



- Serial
- USB
- FireWire
- Parallel
- SCSI
- Network
- PS/2
- Audio
- Video

Serial Ports and Cables

A serial port can be either a DB-9, as shown in Figure 1-11, or a DB-25 male connector.
Serial ports transmit 1 bit of data at a time. To connect a serial device, such as a modem or printer, a serial cable must be used. A serial cable has a maximum length of 50 feet (15.2 m).

Figure 1 Serial Ports and Cables

USB Ports and Cables

The Universal Serial Bus (USB) is a standard interface that connects peripheral devices to a
computer.

USB devices are hot-swappable, which means that users can connect and disconnect the devices while the computer is powered on.

- USB connections can be found on computers, cameras, printers, scanners, storage devices, and many other electronic devices.
- A USB hub is used to connect multiple USB devices.
- A single USB port in a computer can support up to 127 separate devices with the use of multiple USB hubs.

Figure USB Connectors



- USB 1.1 allowed transmission rates of up to 12 Mbps in full-speed mode and 1.5 Mbps in low-speed mode. USB 2.0 allows transmission speeds up to 480 Mbps.
- USB devices can only transfer data up to the maximum speed allowed by the specific port.

FireWire Ports and Cables

FireWire is a high-speed, hot-swappable interface that connects peripheral devices to a computer. A single FireWire port in a computer can support up to 63 devices.

Figure shows FireWire cables with connectors.



Parallel Ports and Cables

A parallel port on a computer is a standard Type A DB-25 female connector. The parallel connector on a printer is a standard Type B 36-pin Getronics connector
length of 15 feet (4.5 m).

Figure Parallel Cable



Network Ports and Cables

- A network port, also called an RJ-45 port, connects a computer to a network.
- The connection speed depends on the type of network port. Standard Ethernet can transmit up to 10 Mbps, Fast Ethernet can transmit up to 100 Mbps, and Gigabit Ethernet can transmit up to 1000 Mbps.
- The maximum length of network cable is 328 feet (100 m). Figure 1-16 shows a network connector.

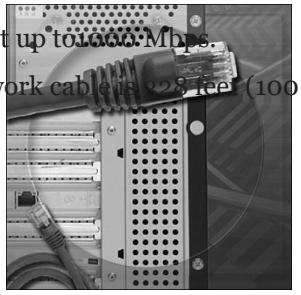


Figure Network Connector

Audio Ports

An audio port connects audio devices to the computer. The following audio ports are com- monly used, as shown in Figure 1-18:

- **Line In** connects to an external source, such as a stereo system.
- **Microphone In** connects to a microphone.
- **Line Out** connects to speakers or headphones.
- **Auxiliary In** is an additional line in.
- **Gameport/MIDI** connects to a joystick or MIDI device.

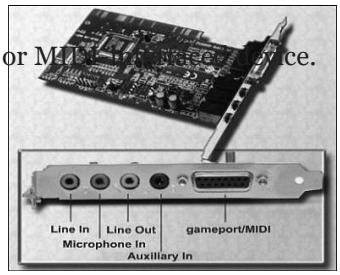


Figure Audio Ports

Video Ports and Connectors

A video port connects a monitor cable to a computer. Several video port and connector types exist:

- ***Video Graphics Array (VGA)*** has a three-row 15-pin female connector and provides analog output to a monitor.
- ***Digital Visual Interface (DVI)*** has a 24-pin female connector or a 29-pin female connector and provides compressed digital output to a monitor. DVI-I provides both analog and digital signals. DVI-D provides digital signals only.
- ***High-Definition Multimedia Interface (HDMI)*** has a 19-pin connector and provides digital video and digital audio signals.
- ***S-Video*** has a four-pin connector and provides analog video signals.
- ***Component/RGB*** has three shielded cables (red, green, and blue) with RCA jacks and provides analog video signals.

Interrupt Requests

- Computer components use ***interrupt requests (IRQ)***to request information from the CPU.
- The IRQ travels along a wire on the motherboard to the CPU.
- When the CPU receives an interrupt request, it determines how to fulfill this request.
- Today, most IRQ numbers are assigned automatically with “plug-and-play” operating systems and the implementation of PCI slots, USB ports, and FireWire ports.

Input/output (I/O) Port Addresses

- ***Input/output (I/O) port addresses*** are used to communicate between devices and software.
- The I/O port address is used to send and receive data for a component.
- As with IRQs, each component has a unique I/O port assigned.

Direct Memory Access

- High-speed devices use ***Direct Memory Access (DMA)*** channels to communicate directly with the main memory.

These channels allow the device to bypass interaction with the CPU and directly store information in memory and retrieve it.

Selfi_check_1

1. What is the purpose of a heat sink installed on a processor?

A. To set the processor voltage C. To set the processor speed

B. To cool the processor D. To ground the processor

2. A technician is installing a new power supply in a computer. Which type of power connector should be used to connect to an ATX motherboard?

A. Berg B. Mini-Molex C. Molex D. 20-pin connector

3. A technician is installing a new power supply in a computer. Which type of power connector should be used to connect to a CD-ROM?

A. Berg B. Mini-Molex C. Molex D. 20-pin ATX connector

5. A technician is installing a new power supply in a computer. Which type of power con
hector should be used to connect to an ATX motherboard?

A. Berg B. Mini-Molex C. Molex D. 20-pin connector

6. Which two connectors are used to connect external peripherals?

A. EIDE B. Molex C. PATA D. PS/2 E. USB

7. Which of the following common tasks are performed during preventive maintenance? (Choose three.)

A. Check and secure loose cables. B. Update the RAM.

C. Clean the mouse and keyboard. D. Update drivers.

E. Reinstall the operating system. F. Install additional peripherals.

Operation Sheet_1 **Module Title: Identify install different motherboard components**

Objective: the trainee will have the right skill and attitude on how to identify, assemble and disassemble a pc component

EQUIPMENT, TOOLS AND MATERIALS: computer with basic hardware components, Philips screw driver , Antistatic rest strap ,paper and pen

Activity

1: Examining inside the computer's system unit

The following operation sheet will identify the internal components of a PC by removing the case and looking inside it. You will then re-assemble the case.

Remove the case of the system unit.

1. Identify internal components inside the system unit.
2. Re-assemble the case of the system unit.

Examining inside the computer's system unit

Part 1: Remove the case of the system unit

1. Turn off the computer.
2. Unplug the power cord from the wall outlet.
3. Disconnect the power cord from your computer.
4. Remove the screws from the sides and back of the system unit.
5. Remove the case of the system unit.
6. Put on your anti-static wrist strap and connect it to the chassis of the PC.

Part 2: Identify internal components inside the system unit

Sketch the inside of the system case. Your sketch should note the location of the following components:

- ☐ Memory chips (RAM).

- ☐ Floppy disk drive
- ☐ Hard disk drive
- ☐ Motherboard
- ☐ CD ROM
- ☐ Power supply unit
- ☐ Graphics card
- ☐ Sound card
- ☐ Network interface card
- ☐ Power cable for the motherboard
- ☐ Signal cable of the hard disk drive
- ☐ Signal cable of the floppy disk drive
- ☐ Signal cable of the CD ROM drive.

LAP Test

Open your computer’s case and remove a RAM module by pressing the tabs at the ends of the slot.

1. How can the type of RAM be identified?
2. Can you see there is only one way in which the module can be installed?

Unit Two: Determine internal hardware components

This unit to provide you the necessary information regarding the following content coverage and topics:

- User Internal hardware component
- User component requirements

This guide will also assist you to attain the learning outcomes stated above. Specifically, upon completion of this learning guide, you will be able to:

- Identify user internal hardware component
- Organize and record user component requirements

User Internal Hardware Component

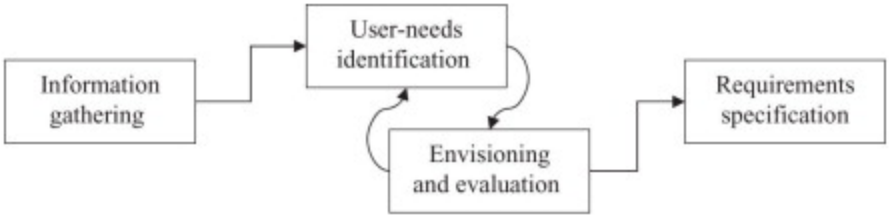
User requirements are typically written when discussing the use cases for a project. The requirements definition is done with the customer or product managers that know how the embedded system will be used by the user.

Understanding user requirements is an integral part of information systems design and is critical to the success of interactive systems. It is now widely understood that successful systems and products begin with an understanding of the needs and requirements of the users The benefits can include increased productivity, enhanced quality of work, reductions in support and training costs and improved user satisfaction.

Requirements should have certain characteristics in order to be effective. Writing the requirements well is as important as determining the right ones. Requirements should be:

- ✓ Solution independent: This means that requirements should not specify a solution to the problem; they should specify what needs to be done, but not how it will be done.
- ✓ Complete: Requirements must cover all areas of concern, including all internal hardware parts.
- ✓ Clear: Requirements should not leave anyone guessing what is required.
- ✓ Concise: Unnecessary requirements should be omitted, and the wording of requirements should be concise. Do not bury the requirement in unneeded text.
- ✓ Testable. When possible, quantitative (numerical) limits, tolerances, ranges and intended values should be indicated. Testable requirements can be measured in order to determine if the component requirement goal is met.
- ✓ Traceable: It should be possible to trace a requirement back to the rationale from which it was derived and forward to its implementation in the design.

A typical requirements capturing process encompasses four elements



1. Information gathering

The first step in user requirements analysis is to gather background information about the system to be supported and how the system is used in service.

2. User-needs identification

In addition to collecting user data, user needs must be identified. Defining these needs is largely influenced by user opinion. A number of methods exist for identifying them.

- ✓ User surveys which mean written questions sent to a sample population of users. Surveys are normally composed of a mix of closed questions (i.e. with fixed responses) and open questions (i.e. the respondents are free to answer as they wish).
- ✓ Focus groups that bring together a cross-section of stakeholders in a discussion-group format.
- ✓ Interviews: In this commonly used technique, users, stakeholders and domain experts are questioned to gain information about their needs or requirements in relation to the new system.
- ✓ Use cases*:* which means symbolic models that describe examples of future use of the system and serve as aids to understanding and clarifying user requirements in specified circumstances?
- ✓ Evaluations of an existing or competing system to provide potential user requirements.

3. Envisioning and evaluation

Once an initial set of user requirements has been developed, it is important to develop a prototype to illustrate them. User feedback can then be obtained on the prototype to validate and refine the user requirements. A number of useful techniques can be employed in this process

4. Requirement specification

A collection of all requirements that are to be imposed on the design and verification of the product.

2.1. User component requirements

2.1.1. Organizing user component Requirements

Below are the steps to write and organize user requirements.

- ✓ Categorize the requirements.
- ✓ Prepare a list.
  Prepare a list of the requirements that are meant to be reviewed by specific stakeholders.
- ✓ Arrange requirements.
  Gather and arrange requirements in a logical order. So when stakeholders review the requirements, it is easy to navigate and also identify missing items.
- ✓ Use unique identifiers.
  If tracing requirement to each other is difficult, then use unique identifiers, ease in traceability.
- ✓ Present requirement in stakeholders preferred method
  In certain scenarios, you might have to present the same requirement in different ways for different stakeholders. For example, one stakeholder prefers a graphical format while the other prefers a structured sentence format.
- ✓ Prepare a table of content.
  Create a table of content for all the requirements. It helps stakeholders to easily track requirements.
- ✓ Use Business Analysis tools.
  Organize requirement documents by process flow.
  In your requirement document, remove all unnecessary requirements, and organize requirement documents by process flow.
- ✓ Map the requirements.

2.1.2. Record user component Requirements

Records are information created, received and maintained as evidence and information by an organization or person, in pursuance of legal obligations.

The key to creating a record, consequently, is the concept of ‘putting the information aside’ in a way that it is either not possible to subsequently modify the information, or, if it is modified, to record how it was modified, when it was modified, and who carried out the modification.

- Records must be managed to ensure they have the following characteristics: Authenticity – the record can be proven to be what it purports to be, to have been created or sent by the person that created or sent it, and to have been created or sent at the time purported.
- Reliability – the record can be trusted as a full and accurate representation of the transactions to which they attest, and can be depended on in the course of subsequent transactions
- Integrity – the record is complete and unaltered, and protected against unauthorized alteration. This characteristic is also referred to as 'inviolability'.
- Usability – the record can be located, retrieved, preserved, and interpreted.

The following should be documented within the requirement specification:

- Identification of the range of relevant users and other stakeholders,
- A clear statement of design goals,
- The requirements with an indication their priority levels,
- Measurable benchmarks against which the emerging design can be tested, evidence of acceptance of the requirements by the stakeholders
- Acknowledgement of statutory or legislative requirements,e.g. for health and safety. It is also important to manage changing requirements as the system develops

Self check-1

Test-I Short Answer

Instruction: write the correct answer for the give question. You have given 3 Minute for each question. Each question carries 5 Point

1. Write the characteristics of effective user requirement.
2. What is user need identification in requirement capturing?
3. Write the steps to organize user requirement.

Test-II True/False

Instruction: write the correct answer for the give question. You have given 1 Minute for each question. Each question carries 2 Point

1. Requirements should not leave anyone guessing what is required
2. Requirements should specify a solution to the problem
3. Gather and arrange requirements in a logical order is one steps in organizing requirements

Note: Satisfactory rating – above 60% Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answers

Unit Three: Obtain Equipment

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Technical specification
- Final Analysis
- Prepare For Installation

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Obtain technical specifications for the proposed components
- Recommend and assessing the options for final analysis
- Prepare obtain components for installation

3.1. Technical specification and Final Analysis

Computer Hardware is the physical part of a computer, as distinguished from the computer software that executes or runs on the hardware. The hardware of a computer is infrequently changed, while software and data are modified frequently. The term soft refers to readily created, modified, or erased. These are unlike the physical components within the computer which are hard.

When you think of the term computer hardware you probably think of the guts inside your personal computer at home or the one in your classroom. However, computer hardware does not specifically refer to personal computers. Instead, it is all types of computer systems. Computer hardware is in embedded systems in automobiles, microwave ovens, CD players, DVD players, and many more devices.

A specification can be defined as a ‘statement of needs or requirements’. It provides a detailed description of the goods or services a supplier is expected to supply during the lifetime of the contract. It is also a record against which suppliers can be measured and is legally binding.

It should encourage fair and open competition within the marketplace and help suppliers make informed decisions on whether to bid.

Specification writing is an important and underrated skill. A supplier shouldn't need to make assumptions – a good specification must include all the right information to enable them to cost up goods or services accurately so a customer can compare bids on a like for like basis. Your specification mustn't mislead suppliers or give them false expectations.

Mistakes with specifications can result in poor service and a waste of public money. You might even breach procurement rules and face legal challenges.

What types of specifications are there?

There are two main types of specification – the input and the output specification.

Before you start, be clear on which one you are writing.

- **Input specifications**

An input specification sets out exactly what is required.

Typically, the solution required by the contract is set out in full and no (or little) further development is needed. This type of specification gives a clear and rigid framework within which the supplier's performance can be monitored. However, the lack of flexibility means that there is little or no incentive for the supplier to innovate or improve service delivery.

Over-specifying can also add cost to the product or service – make sure that the 'gold-plated' option is what you really need.

- **Output specifications**

Output specifications define only the outcomes (or outputs) that are required by the contract, that is, what the supplier is expected to deliver. Output specifications can offer suppliers greater flexibility for developing innovative solutions.

Remember that you do still need to include the relevant standards or legislation, for example health and safety requirements that will apply to the goods or services you are procuring.

How to write a specification – top tips

Take time to get it right. A good specification is created through the planning and research undertaken before writing.

Start by agreeing a timetable and roles and responsibilities. Who is going to write it? Ideally it should be led by someone with relevant skills and experience such as a procurement practitioner or technical specialist. Most local authorities have procurement specialists who might be able to advise smaller local organizations without in-house expertise.

Engage as early as possible with key stakeholders for input (e.g. customers, internal and external technical experts) to help draft and develop it. Make sure that any market engagement carried out to develop your specification is transparent, open and fair. This means asking potential suppliers the same questions and giving each one similar information.

Don’t restrict competition by including bias that favors a particular supplier. Avoid referring to brands, trademarks or any specific processes that are particular to suppliers in the marketplace.

Break down your objectives and then organize your specification into component parts with a clear and logical flow. Include an introduction, then background, scope of services and detailed requirements. Make sure you incorporate information on your brand values so that suppliers can consider and adopt these. Think about what your requirements are – separating into ‘must haves’ and ‘nice to haves’ – and write in terms of outputs. For example, as part of a contract to renovate a hospital car park you might want the contractor to install signage for users.

Your specification could specify precise features and dimensions: where the signs should be placed, dimensions, types of paint, background color, font type, materials to be used etc.

Alternatively, your requirement could be less detail-focused, requiring that signs are prominently placed, provide simple clear information, are readable from a reasonable distance and made from durable materials. In other words, the contractor worries about the detail, you focus on what you want the signage to do.

In practice, your specification might include a bit of both. The point is to think about how the specification you need to write will match the outcome you're looking for. Don't assume a supplier can read your mind.

Make your specification as enforceable and measurable as possible. Be clear what success and failure looks like. If you want to specify for something using exact numbers (for example, time limits, productivity rates etc) be sure that what you are asking for makes sense, is realistic, attainable and can be verified. Use positive and directive language such as 'the supplier shall ensure that the project delivers x, y and z.'

Always write in plain English and avoid technical jargon unless you're sure a person reading it will understand what you're asking for. Avoid empty filler terms such as leverage ', 'world classes, 'synergize' and 'game changer.'

3.2. Prepare For Installation

The first step is to prepare your computer and work environment. In normal situations, computers are fairly durable. However, when their cases are removed and the chips on the inside are exposed, they become vulnerable and must be handled carefully. There are several steps you can take to help ensure that nothing happens to your computer during the installation process. Start by disconnecting all devices from the back of your computer. This includes, but is not limited to: the monitor, mouse, keyboard, speakers, joystick, scanner, printer, and the power cord. EVERYTHING must be unplugged from the computer. Make sure to take note of where things were plugged in as this will help you later on when you have to reconnect everything.

Once you have everything unplugged from the computer, move it to a flat surface, such as a table, in an area that is NOT carpeted. Carpet is an excellent conductor for static electricity and a static electricity discharge can render a computer chip useless. Also, make sure that you remove everything from your work area, especially liquids.

2.2.1. Self-Check 1	**Written Test**

Name:_____ Date:_____

Instruction*:* Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

I. Say TRUE or FALSE

1. The first step to install computer component is preparing your computer and work environment.
2. “Break down your objectives and then organize your specification into component parts with a clear and logical flow” is one of the tip for component installation.

II. Explanation

1. Explain the type of specification.

UNIT FOUR: INSTALL COMPONENTS

This learning guide is developed to provide you the necessary information regarding theFollowing content coverage and topics –

- Task priorities
- Install and configure components
- Test components for error-free performance7
- Resolving problems
- System performance,
- Finalizing Document, the installation and configuration process guidelines

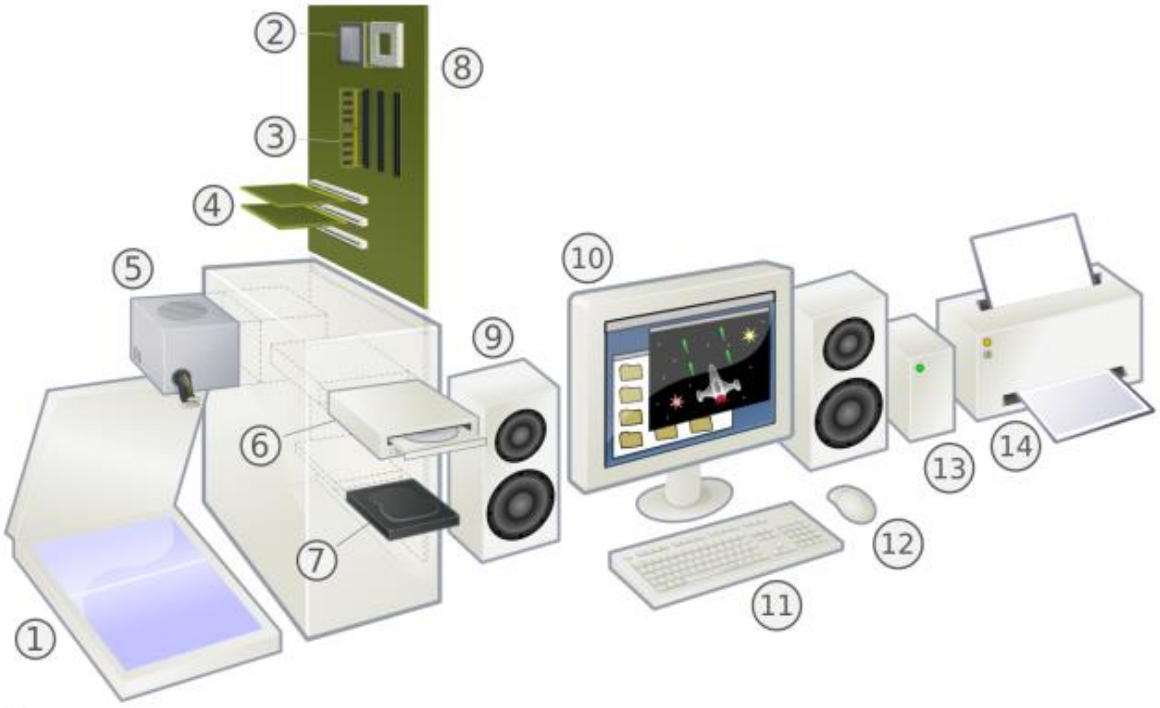
This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this module, you will be able to –

- Develop plans, with prioritized tasks and contingency arrangements, for the installation of selected components with minimum disruption to **clients**
- Liaise with appropriate person to obtain approval for the plans Install and configure

components according to plan, installation procedures and **organizational requirements**

- Test components for error-free performance, using available technology
- Identify and resolve identified problems
- Test and enhance system performance, using knowledge of the system, to meet organizational benchmarks
- Document the installation and configuration process according to organization guidelines

4.1. Computer Components



1. **Scanner**: An input device that can convert the contents of a paper document into a digital image that can be stored in the computer.
2. **CPU** (Central Processing Unit) or the processor: The "brain" of the computer where programs are run. It is one of the most expensive parts of the hardware. Modern CPUs can perform multiple tasks simultaneously.
3. **RAM** (Random Access Memory): The computer's high-speed, short-term memory. It temporarily stores data and instructions for programs that run on the computer.
4. **Expansion Cards**: Circuit boards that can be inserted to add functionality to a computer system (for example: network, sound, or video cards).
5. **Power Supply**: Converts electricity from the wall into the form that the other computer components use.

6. **Optical Drive**: An input/output device that reads data from and writes data to CDs and DVDs.
7. **Hard Drive**: An input/output device that serves as the long-term storage memory of the computer. There are two primary kinds: mechanical drives that use a mechanical arm to read and write data on a rotating disk, and "solid state" drives that have no moving parts.
8. **Motherboard**: A circuit board that holds and connects various components of the computer and allows their communication.
9. **Speaker**: An input/output device that outputs sound from the computer.
10. **Monitor**: An input/output device that displays information visually. Generally, monitors are output devices where the computer visually displays information. Touchscreens combine the functions of output and input.
11. **Keyboard**: An input device on which the user can type to communicate with the computer.
12. **Mouse**: An input device that allows the user to interact with visual objects displayed on the monitor.
13. **External Hard Drive**: An input/output device that serves as an extra hard drive used for additional or backup storage.
14. **Printer**: An output device that can transfer digital data onto paper

4.2. Open the Case



- Computer assembly is a large part of a technician's job.
- Prepare the workspace before opening the computer case.
- There are different methods for opening cases. To learn how, consult the user manual or manufacturer's website.

4.3. Install the Power Supply



Power supply installation steps include the following:

- Insert the power supply into the case.
- Align the holes in the power supply with the holes in the case.
- Secure the power supply to the case using the proper screws

4.4. Attach Components to the Motherboard

- CPU on Motherboard



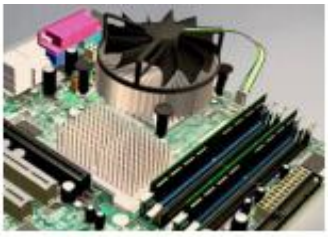
  - The CPU and motherboard are sensitive to electrostatic discharge.
  - The CPU is secured to the socket on the motherboard with a locking assembly.
  - CAUTION: When handling a CPU, do not touch the CPU contacts.

- Thermal compound



  - It helps to keep the CPU cool.
  - To install a used CPU, clean it and the base of the heat sink with isopropyl alcohol to remove the old thermal compound.

- Heat Sink/Fan Assembly



  - The Heat Sink/Fan Assembly is a two-part cooling device.
  - The heat sink draws heat away from the CPU.

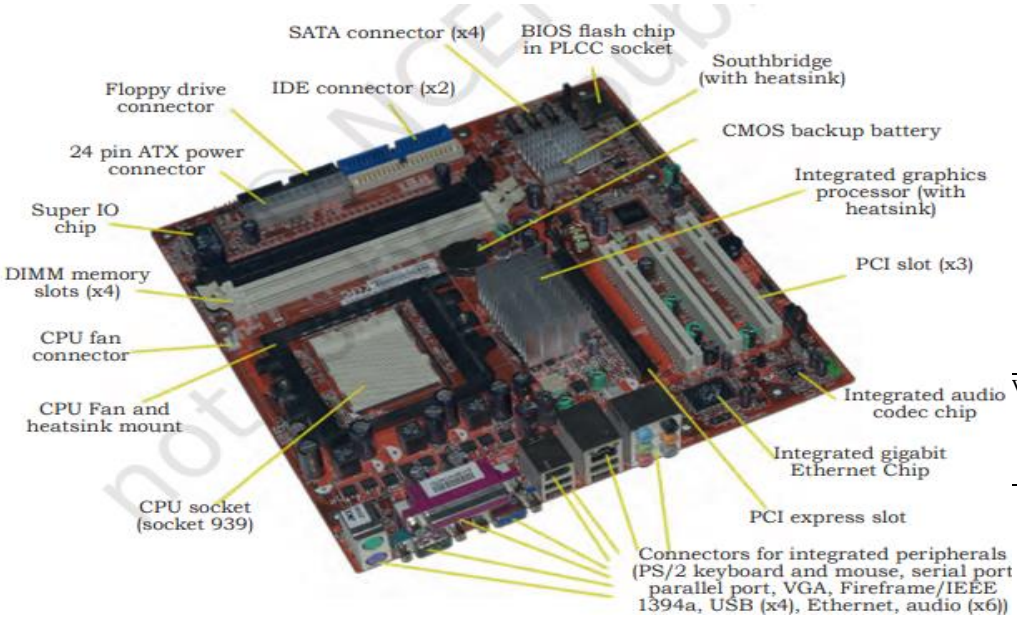
- Install RAM



  - RAM provides temporary data storage for the CPU and should be installed in the motherboard before the motherboard is placed in the computer case.

4.5. The Motherboard

- After installing the previous components, the motherboard is now ready to install in the



computer case.

- Plastic and metal standoffs are used to mount the motherboard and to prevent it from touching the metal portions of the case.

4.6. Install Internal Drives



- Drives that are installed in internal bays are called internal drives.
- A hard disk drive (HDD) is an example of an internal drive.
- HDD installation steps:
    1. Position the HDD so that it aligns with the 3.5-inch drive bay.
    2. Insert the HDD into the drive bay so that the screw holes in the drive line up with the screw holes in the case.
    3. Secure the HDD to the case using the proper screws.

4.7. Install Drives in External Bays



- Drives in external bays allow access to the media without opening the case.
- Some devices that are installed in this type of drives are:
    - An optical drive is a storage device that reads and writes information to CDs or DVDs.
    - A floppy disk drive (FDD) is a storage device that reads and writes information to a floppy disk.

4.8. Install Adapter Cards

- Adapter cards are installed to add functionality to a computer.
- Some examples of these adapters are:
    - A NIC which enables a computer to connect to a network. It uses PCI and PCIe expansion slots on the motherboard.
    - A wireless NIC which enables a computer to connect to a wireless network. Wireless NICs use PCI and PCIe expansion slots on the motherboard. Some wireless NICs are installed externally with a USB connector.

- A video adapter card is the interface between a computer and a display monitor. An upgraded video adapter card can provide better graphic capabilities for games and graphic programs. Video adapter cards use PCI, AGP, and PCIe expansion slots on the motherboard.

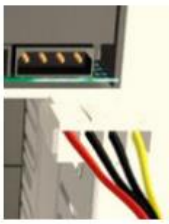
4.9. Connect Internal Cables

- Power cables are used to distribute electricity from the power supply to the motherboard and other components.


ATX


AUX


SATA


Molex


Berg

- Data cables transmit data between the motherboard and storage devices, such as hard drives. Some of examples of this type of cables are:
  - PATA (Parallel Advanced Technology Attachment)cable
  - SATA (Serial Advanced Technology Attachment)cable
  - Floppy drive data cable
- Additional cables connect the buttons and link lights on the front of the computer case to the motherboard.

4.10. Complete Physical Installation

- Now that all the internal components and the power supply have been installed and connected to the motherboard, the following tasks should be completed:
  - Re-Attach the side panels: Most computer cases have two panels, one on each side. Some computer cases have one three-sided cover that slides down over the case frame.

- Connect External Cables: These cables are normally connected to the back of the computer. Here are some common external cable connections: Monitor, Keyboard, Mouse, USB, Ethernet Power.

4.11. Boot Computer for the First Time

- When the computer is booted, the basic input/output system (BIOS) will perform a power-on self-test (POST) to check on all of the internal components.
- The BIOS contains a setup program used to configure settings for hardware devices. The configuration data is saved to a special memory chip called a complementary metal-oxide semiconductor (CMOS).
- POST checks to see that all of the hardware in the computer is operating correctly. If a device is malfunctioning, an error or a beep code alerts the technician that there is a problem.

Self-Check 4

Name: _____ Date: _____

Instruction*:* Answer all the questions listed below, if you have some difficulty doing this self-check, feel free to ask your teacher for clarifications.

Choose the correct answer

1. _____ Is one way to connect your computer with other computers.
   A. Motherboard B. NIC card C. CD card D. ROM card
2. The power supply provides power for_____.
   A. Only components in the computer C. Only the PC peripherals
   B. Both the components in the computer and many peripherals D. Many of the PC peripherals
3. The main circuit board in the computer is called_____.
   A. RAM B. The motherboard C. The bus D. The CPU
4. The part of the computer used for calculations is _____.
   A. RAM B. The CPU C. The bus D. The motherboard
5. The contents of _____ are erased when the computer is turned off.
   A. The motherboard B. The hard drive C. Floppy disks D. RAM

Fill in the blanks

1. _____ form factor is commonly used in tower and desktop systems.
2. _____ form factor can be found in smaller desktop and mini towers.
3. Processor technologies are classified into _____ categories.
4. A _____ is a collection of transistors.
5. CMOS is power driven by a _____ battery.
6. BIOS chip memory is _____.
7. In modern PCs, CMOS settings are stored in _____.

Operation Sheet-1

Operation Title: -Installing HDD in a laptop

Different laptops have different methods for accessing the storage drive.

Required tools and equipment

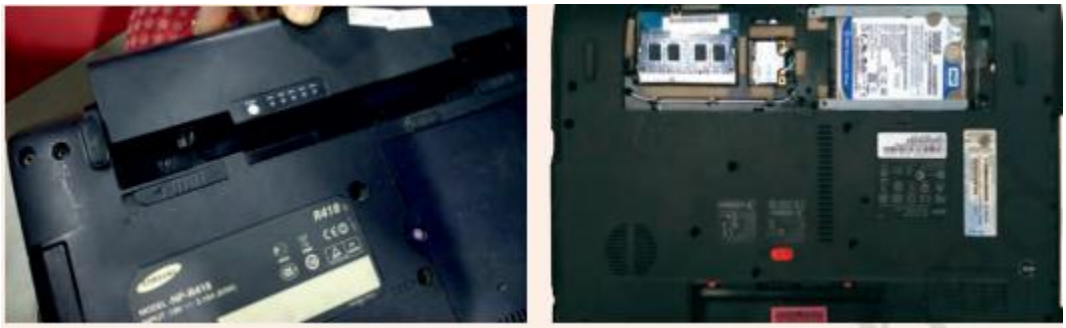
Laptop, mini screwdriver, anti-static wrist strap, magnifying glass.

Procedure

There are several types of small screws that are used throughout the laptop. Place these in small envelopes and write the component name on the envelope. Be organized and keep track of all the screws. We have to figure out how to remove the back panel.

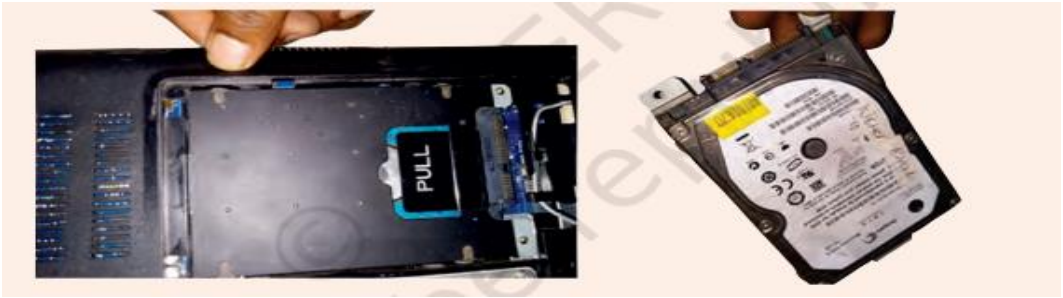
Step 1:

Start the disassembly process by removing the battery. Turn the notebook upside down and remove all screws securing the bottom case. There are two screws (green circles) hidden under bottom.



Step 2:

Remove three screws fixing the hard drive bracket to the case. Disconnect the hard drive cable from the motherboard.



Step 3: Remove the old hard drive from the notebook and replace with new hard disk.

Quality Criteria

Computer Assembly

- Installation of all computer components
- Connection of all cables
- Description of BIOS
- Description of POST



LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: ____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks within 2 hours.

Task 1: Get the Computer Components.

Task 2: Install the Power Supply.

Task 3: Install the CPU on the Motherboard.

Task 4: Install the RAM.

Task 5: Install the Motherboard.

Task 6: Install the Hard Drive and CD/DVD Drive.

Task 7: Install the Video Card.

Task8: Finishing the Computer Build

Unit Five: Evaluate modified system

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Collect client or user feedback and analyze against client requirements

This unit will also support you to accomplish the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify collection of client or user feedback and analyze requirements

5.1. Collect client or user feedback and analyze against client requirements

What is customer feedback?

Customer feedback is information your business receives directly from customers informing you about their experience and satisfaction levels regarding your product or service. Customer feedback can come in from a variety of channels (email, social media) or messenger tools such as Intercom.

Why is customer feedback so important?

Customer feedback is important for future product development, improving the customer experience and overall customer satisfaction levels. Proper analysis provides a company with a better view of what it has to change and improve on to help increase customer loyalty and reduce customer support cases.

The six rules for collecting better customer feedback

2.2.1. 1. The type of customer giving the feedback matters

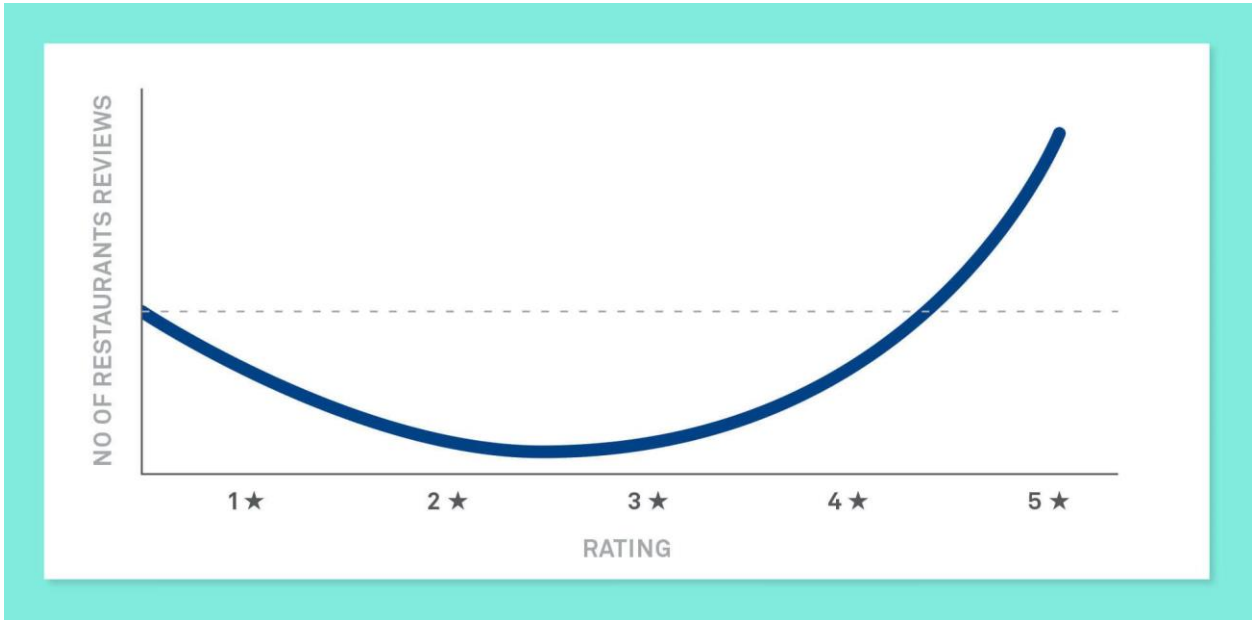
In a business situation, the customer's relationship with your business influences how much weight you give their feedback. Customers who have been loyal the longest have a wealth of experience with your product that makes their opinions particularly valuable. Do you have some new customers who only started using your product six months ago but use it heavily? They're likely to have a lot of insightful feedback. Do you have some customers who pay significantly more than others? You may want to factor that in too.

2.2.2. 2. Whether it's prompted or unprompted, customer feedback matters



Unprompted feedback deserves special attention. Here's one key reason why. The customer issues that aren't on your radar, that you're completely unaware of, can be the most important things you need to hear. You're more likely to hear those left-field issues via unsolicited feedback or from open-ended questions rather than, say, a short survey with multiple choice answers. There's a reason doctors ask if there's "anything else you want to talk about?" at the end of your appointment. It often triggers the patient to talk about their most important issue.

2.2.3. 3. The customer's motivations matter



Remember, people are generally motivated to provide unsolicited feedback if they have extreme experience. That's why you see Yelp restaurant reviews clustered around the "amazing" and "appalling" end of the spectrum. People perceive they'll gain social capital from telling others about the great restaurant they just went to or by warning others against a terrible restaurant.

But the night your dinner was really average? You're probably not going to bother writing a review because, well, what's the point? It's not a very interesting story, is it? The restaurant example of customer feedback illustrates an important principle about motivations.

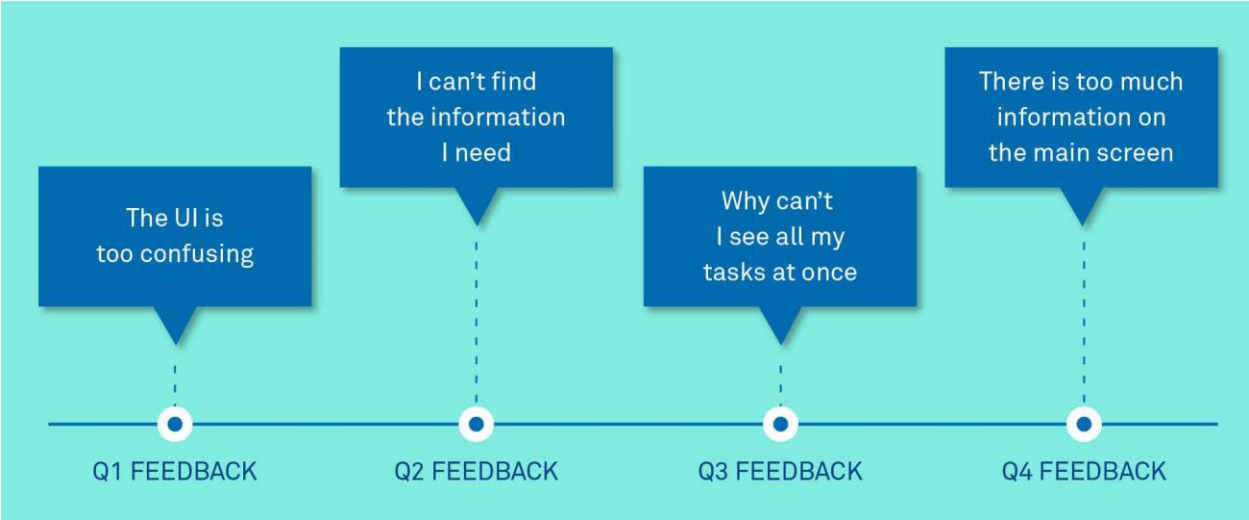
"Your customers are more motivated to tell you when they are very happy or unhappy about your product"

2.2.4. 4. Volume matters



If 80% of your customer feedback in the last month is telling you that the "improvement" you made recently to your core product has broken people's workflow, you should listen up. The overall volume of feedback about a single issue relative to other issues matters. It will also protect you from "fre-cently" bias, where people assume things they hear frequently or recently have the greatest importance.

2.2.5. 5. Repetition matters



User issues are often dismissed on the grounds that "Oh we've heard that for years." Maybe you're planning to finally address that issue in a big redesign next year. Or more likely this request has become so repetitive that it's become trite, a sort of dull whine that nobody listens to anymore.

Either way, this kind of feedback is really worth listening to, especially when it relates to product quality, bugs, or difficulty achieving a core task in the product. It's an indicator you haven't got the basics right, and that's something you have to address as a priority rather than ignore.

2.2.6. 6. The stakes matter



Some feedback is worth listening to purely because of the severity of the problem the customer is experiencing. This is high stakes feedback. Perhaps you pushed a release that had a security loophole, or your product has accidentally put consumer's privacy

at risk. When reviewing customer feedback, build a mechanism that alerts you to this kind of very occasional but high stakes feedback so you can take action straight away.

How to collect customer feedback?

There are a number of feedback tools, methods, and systems you can use to gather customer feedback and learn about their pain points. Here are three places where you can proactively (or reactively) hear what your customers are saying.

2.2.7. Chat

Live chat is a frictionless way for customers to communicate with you directly. You can ask specific real-time questions (prompted) or passively categorize the inbound feedback (unprompted).

2.2.8. Short surveys

Asking your customers questions regarding specific features, aspects of your platform or parts of their experience is an easy and direct way. Measure customer satisfaction with customer feedback surveys. Here's how to do it with Intercom.

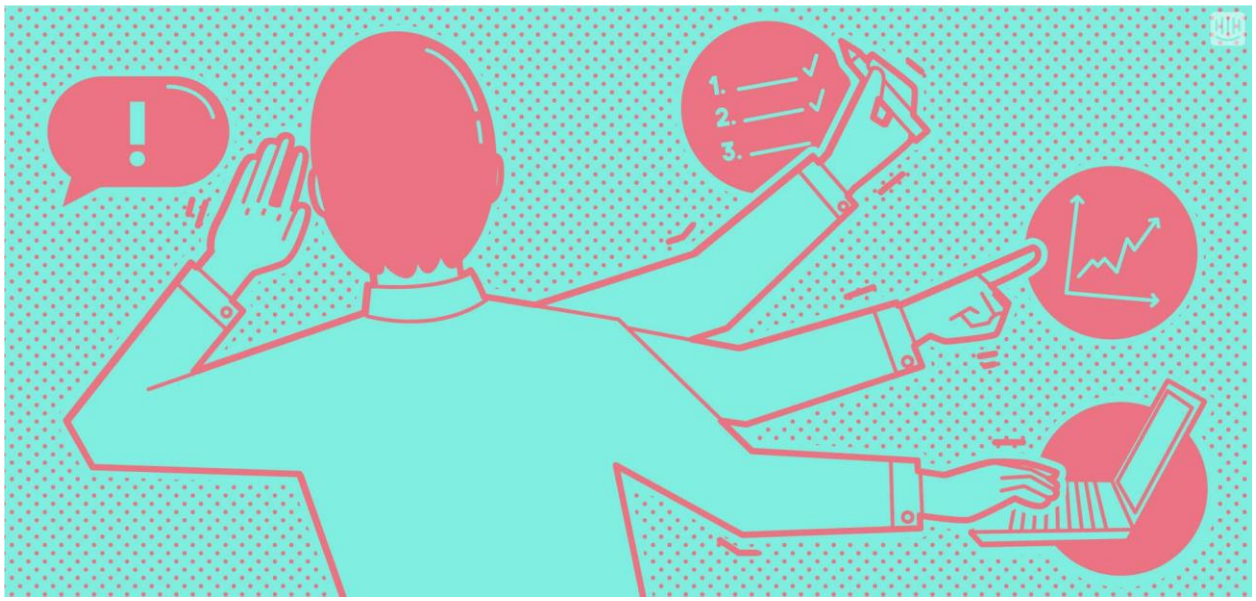
2.2.9. Social media

As you've probably noticed, people like to express their feelings on social media. While it is oftentimes not constructive, you can actually find extremely valuable feedback on Facebook, Twitter, and other places. Customer feedback on social media tends to reside on either end of the spectrum – elated or infuriated. But if trends appear, you should incorporate it into your analysis. You can forward messages from your social media accounts into Intercom.

Seven steps on how to analyze customer feedback:-

Once you've determined how you collect customer feedback and decided which customers' feedback you want to pay attention to, how do you transform customer feedback into something you can act on as a company? How can you take a jumble of feedback from open-ended questions and use it to inform your product roadmap?

Follow these steps, and you'll have a prioritized list of customer insights you can act upon with confidence. You can even use the output of your analysis to inform your product roadmap.



2.2.10. 1. Collate your data

First, collate all the open-ended customer feedback you want to analyze, plus key metadata about each customer, into a spreadsheet. Ideally, the metadata will include attributes such as how long the person has been a customer, how much they spend, the date the feedback data was submitted, and the source of the feedback e.g. open-ended customer survey question. Of course, you can use Intercom to help gather this data. Your column headings should look something like this:

Product area	Customer feedback	Feedback type	Feedback theme	Feedback code	Customer since	Customer type	Monthly spend	Feedback submitted	Source	Customer ID
Rewards team	"I love your product! I really wish I could send stickers to my team mates to say thank you"	Feature request	Stickers	Ability to send stickers to teamates	6/7/2014	5 DAU	$150	1/11/2016	Website feedback form	NC295 473

2.2.11. 2. Determine how to categorize the feedback

A general rule that you can apply to help you make sense of customer feedback is to group it by:

Type of feedback

- Feedback theme
- Feedback code

Let's break these down.

Feedback type

Categorizing your feedback into different types is particularly helpful if you're dealing with unclassified feedback from your customer support team or situations where customers could write anything they liked in a survey field (e.g. "Any other feedback for us?")

Here are some categories you may find useful:

- Usability issue
- New feature request
- Bug
- User education issue
- Pricing/billing
- Generic positive (e.g. "I love your product!")
- Generic negative (e.g. "I hate your product!")
- Junk (this is useful for nonsense feedback like "jambopasta!")
- Other (this is useful for feedback that's hard to categorize. You can go back and recategorize it later as patterns emerge in the rest of the data)

2.2.12. 3. Get a quick overview

You want to get a feel for the data before starting to codify it. Scan through the feedback to get a sense of how diverse the responses are. As a general rule of thumb, if each customer is giving you very different feedback, you'll likely have to analyze a higher volume of feedback in order to see patterns and make it actionable. If you scan through the first 50 pieces of feedback and they all relate to a specific issue in your product, then you'll likely have to review less.

2.2.13. 4. Code the feedback

Time to roll up your sleeves and focus. Find a place you won't be disturbed and start reading through each piece of user feedback, carefully coding each row.

The exact feedback codes you create will be specific to the product that the feedback relates to but here are a few analysis codes for some fictitious new feature requests to give you a flavor:

- Assigning a task to multiple clients
- Adding complex HTML to tasks
- Adding or removing teammates from any screen
- The ability to send emoji to clients

If one piece of feedback is communicating multiple points (e.g. two different feature requests), it's useful to capture these two separate points in separate columns.

2.2.14. 5. Refine your coding

It's okay to start with higher-level codes and break them down later. Pay attention to the exact language people use. Issues that sound similar upon first glance might actually be separate issues.

2.2.15. 6. Calculate how popular each code is

Once you've coded everything, the next step is to calculate the total amount of feedback per code. This will help you see which feedback is most common, and what the patterns are in your customer feedback.

2.2.16. One super simple way to do this is to sort the data in your "feedback type", "feedback theme" and "feedback code" columns alphabetically, which will group similar items together. Then highlight all cells that have the same feedback code and a total count will appear in the right-hand corner of your spreadsheet.

2.2.17. 7. Summarize and share

Now you've coded your data, you can create a summary of customer feedback data based on issue popularity and discuss it with your product team.

- If you've got less than 50 pieces of feedback – summarize actionable feedback in a simple table or one-page doc.

A larger set of feedback, can be broken down by the other variables we discussed earlier ("feedback type" and "feedback theme") total counts for each feedback code.

Participants of this Module (training material) preparation

No	Name	Qualification (Level)	Field of Study	Organization/ Institution	Mobile number	E-mail
1	Zerihun Abate	A(MSC)	IT	Sabata PTC	0911858358	Zedoabata2017@gail.com
2	Michael Kassahun	Bsc	IT	Misrak PTC	0989308914	Miko3mt@gmail.com
3	sewAyew W/Yohannies	Msc	IT	Sod PTC	0911716133	Sewnet1221@gmail.com
4	Yonas Beyan	Msc	IT	Ethio-Italy PYC	0915007456	Yonas.beyane@gmail.com
5	Abebe Mulatu	Bsc	IT	Daye PTC	0904834788	abebemulatumgh@gmail.com
6	Solomon Yilma	Msc	IT	Asossa PTC	0911954729	sollangano@gmail.com
7	Yohannes Bekele	Bsc	Computer science	Hawasa PTC	0939797218	Ybekele71@gmail.com
8	Tewdros Girma	Msc	IT	Sheno PTC	0911835002 0912068479	temutd@gmail.com
9	Subagadis Gigar	Bsc	Computer science&ICT	MoLS	0920193859	subiartpromo@gmail.com

Reference

keit103.pdf (ncert.nic.in)