THE COMPUTER WORKSHOP

Aim
To establish a computer repair workshop.

TOOLS

The Basics
In computer servicing, you need to equip yourself with a set of basic computer toolkit. A complete set of toolkit can be purchased from your local hardware store. The list below shows you some of the commonly used tools

Basic hand tools

There are various computer tool kits on the market, which are designed to provide the equipment needed by a technician. They are primarily intended to provide equipment needed to assemble or disassemble a computer and/or peripherals. They may or may not also include other equipment. Cost, range of tools, and the quality of equipment can vary a great deal.

The most basic equipment may include:

- **Standard screwdrivers** – You will require one small and one large flat bladed screwdriver. Most computer cases are held together with Philips head screws with a slot across to accommodate flat bladed screwdrivers but some are now being fitted with security screws that require special screwdrivers. A Philips head screwdrivers is almost a necessity for power supplies, interface cards and hard disk mountings slots. Check before setting off for a site visit.

- **Crescent wrench** – Useful for holding on to screws in places that you cannot reach with your hands or for unscrewing screws

- **Long nosed pliers**

- **Tweezers** – Extremely useful when small parts are dropped in inaccessible places.

- **Parts grabbers** (claw type)

- **Torx drivers** – These are used to remove the star shaped screw heads found on many Compaq machines.

- **A flashlight and magnifying glass** – To look under motherboards and in dark parts of the PC case and to make markings on the motherboard easier to view.

- **A small plastic container** – For keeping screws, nuts and retaining straps etc.
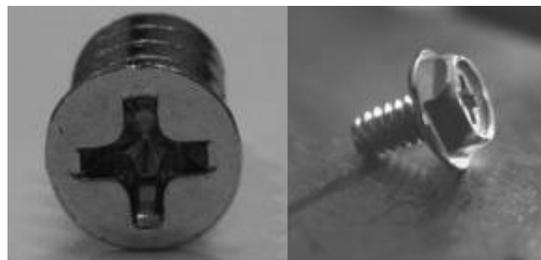
Phillips screw head   Hex cap screw   Long nose plier

Torx-8 Screw   Assortment of Torx driver bits   Socket spanner

Cleaning Equipment and Materials
Contact cleaning chemicals, compressed air, bristle brush, hand vacuum cleaner.

Software for testing/diagnosing components in a system
Diagnostics Hardware for testing components in a system. When failure of hardware is suspected, a working set of the same hardware can be used to confirm if the hardware is faulty.

Anti-Static Wrist Band, Mats and Anti-Static Bags
Damage can be caused to circuit boards by static discharge therefore anti-static equipment is vital. Spare PC components should always be stored in protective anti-static bags, such as those used by manufacturers to supply interface cards.

ADVANCED REQUIREMENTS

The following equipment is more specialised, not required so frequently, but nevertheless useful. These tools are useful if you are interested in Computer Engineering. In this course, you will not cover the electrical circuitry of computers in detail.

Specialized hand tools
- Pin grid array (PGA)
- Plastic leaded chip carrier (PLCC)
- Chip removal tools – The importance of these tools cannot be overstated. If you try to pull out a processor chip without one of these tools, you are going to damage some expensive equipment.
- Soldering tools
- Soldering iron

Logic Probes and Pulsers
These are used to analyze and test digital circuits.

Power Supply Testing Equipment
Variable voltage transformers and load testers.

Memory Testing Machines
These may be used to evaluate the operation of computer chips, memory modules etc.

Oscilloscopes
These can be used to accurately display digital and analog signals, to analyse their purity and timing.

A Digital Multimeter
This is used for testing power supply voltages and cable connectivity. Many trouble shooting procedures require voltage and resistance to be tested. Values are measured using a hand held multimeter. The meter may have an analog or a digital (LCD) read out and will use a pair of probes to connect to the device being tested.

Wrap Plugs
These are used to diagnose serial and parallel port problems.

ESD kit
This is an electrostatic discharge protection kit.

Software tools
Installation software for drivers should be easily accessible should you need to replace a faulty hardware. Be sure to keep them handy. Missing drivers could be downloaded from the internet or obtained from the manufacturers. Be sure to know which drivers you need.

GUIDELINES FOR USING BASIC TOOLS

Always be safe

Take the proper precautions to avoid any electrical shocks before opening your PC's case. Besides turning off the computer, you need to ensure that the power cord is unplugged from the back of the computer's case. Electrical shocks will not hurt you but the static can destroy the hardware components in the computer.

Electrical Safety

Voltages used for domestic power supplies vary between 110 and 240V, sufficient to give a serious electric shock. Display equipment such as computer monitors generate and store voltages of up to 15,000 volts (15KV) for black and white monitors, and 30,000 volts (30KV) for colour monitors. These voltages can be present even when the equipment has been switched off for some time.

It is vital that basic electrical safety guidelines are followed at all times when working on electrical equipment. In conjunction with any additional formal instructions the following should always be noted:

- Do not touch any electrical equipments or power points if your hands are wet, or if the equipment itself is wet.

- If any electrical equipment catches fire, ensure it is unplugged as soon as possible, and never use water to put out the flames.

- Do not pull out the plug of any electrical equipment before turning it off.

- When you disconnect electrical equipment, do not hold the cord. Instead, you should only hold the plug

- Do not work with electrical equipment unless you know what you are doing and are sure of the consequences.

- Remove all jewellery while working on electrical equipment.

- Beware of building up static electricity or electro-magnetic energy – insulate, be cautious etc.

- Use extreme care when applying any of the above tools. In general most adjustments will not have to be forced.

- Use the right tool for the right job – don't bend or damage parts

- Use chip extraction or insertion tools to handle chips and be cautious not to bend any pins on a chip.

- Always replace blown fuses with one of the correct rating and always check that the existing fuse was rated correctly.

- Never work alone – there should be always someone nearby to assist in an emergency.

Soldering

There will be occasions when a soldering iron will be necessary to fix a broken wire or similar problem on a circuit board. Not all boards are the same design wise, soldering on the motherboards should be minimal and then only on components that can be pulled through. Never throw out old motherboards as these will be ideal to practice upon.

In general, only those experienced in using a soldering iron should use this tool on a computer. The actual soldering iron will need to be specially selected. No more than 25 watts as hotter irons will cause damage to other components. It is recommended that the soldering iron should not dissipate more than 25 watts, because hotter irons are capable of damaging some of the components on a computers' motherboard. Ideally, a computer workshop should invest in temperature controlled soldering irons because they are less likely to cause damage to the computer's components, or the motherboard.

A solder sucker will allow more precision as well as quicker working speed. A solder sucker keeps the area being worked on clean of hot solder when dismantling pieces.

Using an Electrician

It may be illegal to tamper with the electrical system of a building. It may however be that problems in the electrical system are the source of problems in a computer.

Be aware of how far you can go....legally!

THE COMPUTER WORKSHOP

When first establishing a computer workshop, generally one of the major restricting factors will be cost. Therefore any workshop will need to be cost efficient, whether it is owned or leased. It should be large enough for uncluttered working and storage area. Most workshops also have at least a minimal display area for new or even 2nd hand product sales. Typically computer workshops have only a small front office area for customer pick up and some display, while out the back is work space and storage. This type of workshop should be cheaper to lease than one with a large showroom area. Some initial research will need to be done to determine the amount of business that might be expected. This will probably dictate size, location and cost of any workshop.

Many computer technicians work from home initially until they feel that they have a sufficient customer base to warrant expansion into a larger site.

Main Components of a Computer Shop Offering Servicing & Other Facilities

- Counter for sales, security of cash, goods and staff, dealing with customers.
- Sales/service display.
- Workbenches.
- Adequate space, lighting and electricity (including work and storage areas).
- Customer waiting area (optional but very useful).
- Cash register/ credit card facilities.
- Telephone.
- Tools associated with computer repair (Eg: Basic toolkit and driver softwares)
- Dedicated staff to process online orders or online requests, if the workshop has a website, or if it has an email address dedicated to receiving client's requests or orders.

Also Useful

- Computer and printer for business applications.
- Reliable internet access.
- Photocopying machine.
- Lunch and tea room facilities.

Workshop Layout

The workshop layout must be practical, comfortable and within registered government health and safety standards. One problem that computer workshops seem to be afflicted with is insufficient storage space. Poor layout could result in a cluttered and inefficient workshop. Parts that are being replaced but not discarded, repaired computers whose owners are not in a rush to pick them up, and new parts that have been ordered can all contribute to this problem. Having good workshop layout as well as good ordering and customer awareness data should alleviate this problem to some extent.

Ensure a workshop is safe by:

- Installing guards on any dangerous equipment (e.g. exposed electricity),
- Placing grates over vents or other exposed holes (e.g. floor drains which you may trip over),
- Installing non-slip surfaces where necessary
- Making sure the area is clean, dry and well lit

- Setting procedures (eg. only trained, competent and authorized staff allowed to use or repair machinery or equipment),
- Providing a kill switch (instant shut-off) on dangerous equipment.

Always assume electrical systems are 'alive '. Test and tag electrical systems.

TOOL MAINTENANCE

Looking after your tools is very important to safety! If you look after them, they will be reliable. Tools in good condition will perform in a predictable fashion.

Some simple reminders are listed below:

1. Metal
Metal tools may corrode. To prevent rust or corrosion metal either needs painting with a good metal primer, or regular coating with oil, e.g. after use, clean and wipe metal parts with an oily rag.

2. Sharpening
Some tools need to be sharp. Keeping your tools sharp usually means less effort is required to use them, so less strain is applied and you are less likely to slip and injure yourself or damage parts.

3. Cleaning
If tools are kept clean they are less likely to corrode or have moving parts seize. This also reduces the likelihood of micro-organisms being carried on tools (and the chances of being infected if you cut yourself). Wiping a knife blade with methylated spirits can be an effective way of destroying any micro-organisms.

4. Storing
Keeping your tools stored properly means they are less likely to be damaged, lost or stolen. They can also be found more easily when required, saving time. Tools left lying around can also be dangerous, particularly if you have young children, or they can be used by burglars to break into your house, garage, sheds etc.

5. Driver software
Ensure that you have updated driver software. These drivers usually come together with the hardware so, keep them properly labelled and easy to access.

MANAGING AND GROWING THE WORKSHOP

- After opening a computer workshop, there are a couple of steps that should be taken into consideration because they would eventually facilitate the growth and expansion of the workshop. These steps include, but are not limited to the following:

- Setting an hourly value for the workshop, in accordance with the town or suburb where it is located. Nearly a decade ago, computer workshops would consist of selling and repairing computer parts, whereas nowadays, it's more about providing services to customers to assist them in preventing computer problems. If you are running a computer workshop business, you need to make sure that you remain competitive, by examining your competitors' costs and their strategies.

- The computer industry is an extremely cut throat business as far as pricing goes. Due to a never ending range of newer and updated technology, many computer components are quickly out of date and therefore useless if not sold on during their heyday. State of the art components may only fall into that category for as little as 1 - 3 months before they are superseded. It is pointless and bad business to have stock that will not be used laying about the workshop. Order stock only when necessary.

- Charging for computer repairs is another area of the computer industry which needs to be approached carefully. Often older machines will not warrant repair but could possibly be upgraded. Customers should be made aware of their options when they approach you with a problem. All costs involved should be explained and itemised. This is simply good customer relations and conveys a sense of professionalism to your customers. Things to be taken into consideration while ordering computer parts are shipping, handling and insurance costs, as these should be added to the final quote that will be communicated to the customer.

- Determining the customer base for the business, depending on whether the business is going to operate within its local community, or whether it will advertise its services nationally or over the internet. Whether you decided to target residential clients and try to win them as your customers, or if you found a niche market with some law firms, schools or universities for example, you will still need to ensure that you are putting enough effort to constantly market the business, to keep it competitive in the market. Offering discounts for existing customers will make them happy and encourage them to keep returning to your workshop.

- Knowing your strength and weaknesses to assess the needs for your business. For example, if you have a technical background, you will need to employ reliable bookkeepers and accountants in order to look after the business side of the workshop, as these will help keep the business in the market.

- Keeping up with technology. This is very essential because technology keeps evolving, and it is never enough to simply "read" a manual about new technology; instead, you should practice the new skills before you master them, regardless of the amount of experience you have in the computer field. Therefore, it is essential to undertake continuous education and training to keep your skills, and the skills of you employees current.

- Customizing the workshop, and ensuring it complies with health and safety regulations. The workshop area should be kept tidy at all times, to minimize injury, fire hazards, or health hazards to employees or customers alike. This requires a great deal of organization and commitment to keep things clean and tidy.

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- Ensuring staff are friendly and motivated because these will help maintain and grow the customer base for the workshop business, which will eventually bring you more money. Prior to hiring a new employee, make sure you assess both their technical and interpersonal skills, keeping in mind that you can always offer the successful candidates extensive on-the-job training if they lack any of the skills required. Furthermore, since most of today's market is based on services, you need to employ candidates who will give a good impression to your customers as this will make your current customers happy, and will eventually bring you more customers, thus generating more income.

- Ensuring the staff are well trained and certified. Repairing computers does not specifically require any particular certifications, it mainly relies on experience; however, business clients will often require that you are certified to determine whether the business is competent or not.

- Treating customers well by being honest with them. When a customer comes into the workshop with a problem, they generally expect you to address their concerns quickly and offer a solution and honour your promises to resolve their problem within the deadline set and for the amount of money. It is very important to have a good reputation amongst the customers in the market, because they are very likely to encourage their friends and colleagues to use the services of your workshop.

- Maintaining the security of the equipment and computers in the computer workshop, especially that most of the items would belong to customers. Therefore, it is important to keep accurate records and logs at all times, as these will help identify all the items present in the workshop, along with their serial numbers and the date they were dropped into the workshop. The logs can also hold a complete description of the customers' computers, such as the manufacturer's details and the machine's specifications (number of drives and amount of memory). You should also be able to identify which computer belongs to which customer.

RECORD KEEPING

Good record keeping is simply good business sense. All transactions, repairs undertaken and parts ordered must be put on record. Apart from enabling financial planning for the future it also means less headaches at tax time. It allows you to chart the progress of your business and to change those areas that are lacking or unnecessary. If you do not feel comfortable with record keeping, you could either enrol in a short course or hire a professional to do this for you.

FINANCIAL RECORDS

It is extremely important to keep accurate, clear and accessible records of all financial transactions which take place in a business. Different businesses have different types of book keeping systems. There are many optional systems for you to choose from. A balance must be struck though where you decide between a system which gives you the detail you require and one which doesn't take too much time to maintain.

Financial records are needed because:

- They help you manage your finances.
- You can make decisions about what something is likely to cost in the future by seeing what it cost in the past.
- They allow you to see whether your business is making a profit or loss.
- They give you a basis upon which you can calculate what you will charge your customers.
- They allow you to prepare and submit your tax returns.
- They are legally required by government.

The Simplest Approach

Many small businesses do little more than keeping a record of money spent in their cheque book (and all spending is deliberately channelled through the cheque book); and keeping a record of payments received in their pay in bank book. At the end of each financial year, these records are given to their accountant, who then prepares their taxation return and any other necessary financial records (such as a balance sheet or profit and loss statement). There is nothing wrong with this approach, though something better is generally desirable.

WORK SCHEDULING

It is important when beginning a business to give your customers the very best service that you possibly can. New customers who have not dealt with you before will be watching for signs of tardiness, inattention, sloppiness of work, etc. They will also be quick to relate to others excellence of service and genuineness. Word of mouth advertising is priceless and should never be underestimated. It is for these reasons that work scheduling is important. Work out approximately how much time standard repairs will take; include diagnosis, dismantling, repair and reassembly.

DO NOT over book either yourself or your workers as this will result in mistakes, repairs that are brought back, and time and money wasted.

The following points apply to work scheduling in an organisation of considerable size with a number of employees involved. The basic premises however can be applied to businesses of any size including a small workshop operation.

Before planning can commence, you need to know:
- Details of all major programs which might affect decisions which may be made (i.e. budgets, costs, resources etc.).
- Policies of the organisation. Work schedules are defined by such policies, which might include not working Sundays for instance.
- Expectations of management – what amount of work is expected from this department.

- Planning a work schedule involves a similar process to the problem solving technique:

Step 1. Define objectives, goals, tasks to be achieved.

Step 2. Put forward several alternative courses of action.

Step 3. Make a decision which of the alternative courses of action will give the best result.

Step 4. Put the chosen plan into action.

The following criteria need to be considered when making decisions about work schedules. (These are the things to think about when trying to decide which of your alternative courses to select and follow.)

Major Programs
Details of any major programs which relate to work tasks should be known so planning dovetails into the larger project.

Area of Discretion
Identify the terms, policies, limitations etc. set down by management (e.g. if there are strict safety procedures, these must be accounted for when allocating time and resources to a certain job).

Forming a Routine
All jobs need to be reduced to routine, practical steps.

Feasibility
If a course of action is not feasible, then it cannot be adopted.

Commitment
Courses of action must be consistent with current and future commitments. Resources cannot be changed if they have already been allocated (e.g. if you have five men in your charge and three are involved with routine maintenance work, it is wrong for you to allocate more than two to extraordinary work).

Cost – Benefit
Generally speaking, the least costly course of action is preferred (given that the benefit from each alternative being considered would be the same). If one course returns greater benefit than the others, that is to be preferred.

Credibility
The course of action selected must be acceptable to both your superiors and the workers you are in charge of. If a course of action lacks credibility it should be discarded.

Uncertainty
There should be minimum risk in any course of action which is selected. If there are things which you cannot be sure about (e.g. whether materials will be available on time), then that alternative should be discarded. A work sheet such as the one below can be used to compare alternative courses of action and help with making a decision.

WORKSHEET FOR PLANNING A WORK SCHEDULE

Task	Alternative 1	Alternative 2	Alternative 3
Material Equipment Supplies	**What is Needed**	**Why That Much?**	**Would others do?**

Machines & Workplaces	What work must be done?	Why There?	Anywhere Else?
Sequence of Work Tasks	When must job be done	Why then	Any Alternatives?
Method of Work	How should tasks be done?	Why that way?	Any Alternatives?
Numbers & type of Employees	Who should do the job?	Why them?	Who else?

CUSTOMER QUOTATIONS

When customers bring their computer problems to you for diagnosis and repair usually they will expect a detailed quotation. You should explain in simple terms what the problem is, how it can be fixed and what the costs involved will be. A written estimate, when accepted by the customer, becomes an agreement between you as to the scope and expense of the repair work. Remember to include both the cost of the technician's labour time and any replacement parts that might be needed. A sample Repair Estimate Form is show below.

REPAIR ESTIMATE FORM (SAMPLE ONLY)

- Client Name: Mr. J. Smith
- Project: Video Card Repair/ IBM-comp 386 dx40
- Department: Workshop

Component: Find problem and solve		Supervisor's name: B. Brown		
LABOUR		**MATERIAL**		
Job title	No. of hours reqd	Description	Quantity	Value($)
Technician	1	1-2	Probably needs 1 X 512k	$150
$15/hr		new v/card	@ $120	

Set Task

- Visit your local hardware store to check out at least 2 brands of the following items: Socket spanners, screwdrivers and Torx drivers.
- Visit one computer servicing and repair shops and observe the work space in terms of
- Sales/service display, workbenches and work area layout, customer waiting area and find out prices of different computer services provided.

Assignment

Question 1

Imagine that you are about to start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of? (2 paragraphs)

Question 2

You have managed to obtain a five year lease on a standard rectangular building for the purpose of starting a computer workshop. The interior is without walls or fittings and measures 5m X 10m. Design an appropriate workshop layout (i.e. draw a labelled sketch plan). Include such things as:

- Serving counter(s)
- Dividing walls
- Benches
- Display areas
- Storage areas.

Any further fittings that you feel would be necessary. (1 page maximum)

Question 3

Explain the importance of good customer relations. What sort of business procedures should be adopted when dealing with customers? (1 paragraph)

Question 4

Briefly explain the following terms and their significance to a computer workshop:

- Work scheduling
- Charging
- Record keeping.

Question 5

Please complete the supplied questionnaire (on the next page) and send it back with your assignment.

TO FIND OUT MORE ABOUT THIS COURSE PLEASE VISIT

https://www.acsedu.co.uk/Courses/Information-Technology/COMPUTER-SERVICING-I-VIT203-327.aspx