Grade 12 A/L ICT · Lesson 1

1.2 Why We Need Technology for Information: Uses, Manual Methods and the ICT Era

Syllabus 1.2. People use information every day to decide, plan and predict. In the past this was done by hand with paper files, which was slow and full of mistakes. ICT solves many of these problems. In this part you learn how information is used, the drawbacks of manual methods, and how computer networks, the Internet, the WWW, mobile communication and cloud computing developed.

1. Information in day to day life



Information helps in many daily activities.

Use	Meaning	Example
Decision making	Choosing the best option	A student chooses a university course using Z-score cut-offs
Policy making	Making rules for a country or organisation	Government uses census data to plan schools
Predictions	Saying what may happen in future	Weather forecasts, dengue outbreak warnings
Planning	Deciding what to do and how	A farmer plans crops by the rain season
Scheduling	Fixing times for tasks	Train and bus timetables, exam timetables
Monitoring	Checking progress against a plan	A hospital monitors a patient's heart rate

2. Drawbacks of manual methods

Manual methods mean handling data by hand using paper, registers and files. They have these problems:

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- **Inconsistency** – the same fact is different in two files (one says 17 years, another says 18).
- **Duplication** – the same data is written again and again in many registers.
- **Room for errors and human errors** – tired people make mistakes in writing and adding.
- **Delay in processing** – finding and calculating by hand takes a long time.
- **Lack of sharing information** – a paper file can be in only one place at a time.
- **Reduced customer services** – customers wait in long queues.

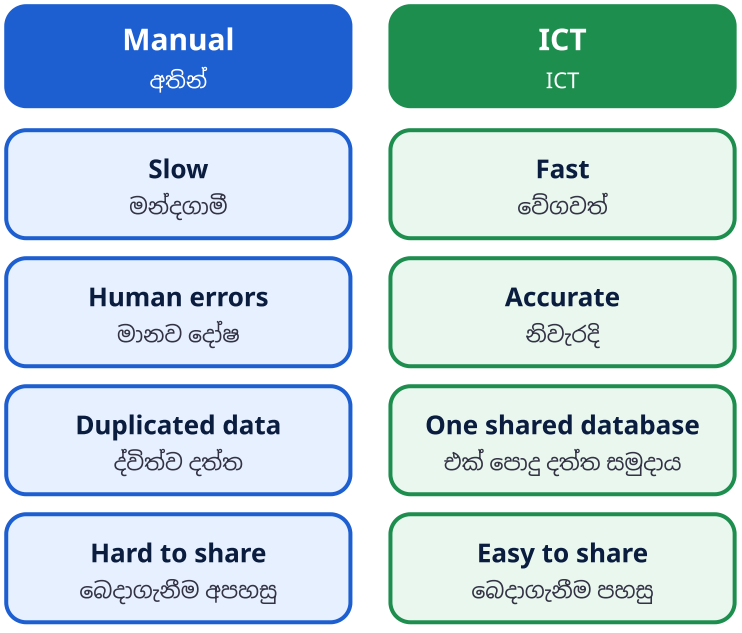
> 🧮 **Worked example: A clerk processes 1,000 forms at 25 forms per hour with 2 errors per 100 forms. A computer processes 500 forms per minute.**
> Clerk time = 1,000 ÷ 25 = **40 hours**. Expected errors = 1,000 × 2 ÷ 100 = **20 forms with errors**. Computer time = 1,000 ÷ 500 = **2 minutes**. ICT is much faster and, with validation, makes far fewer errors.

3. When manual methods are harmful to humans

Some work is **infeasible** (not possible or not safe) for people. Machines controlled by ICT do it instead, and this protects the **safety of human operators**: measuring radiation inside a nuclear plant, exploring deep sea or space, defusing bombs, spraying chemicals, working inside very hot furnaces, or checking gas leaks in mines.

4. The emergence of the ICT era

ICT (Information and Communication Technology) joins computers (to process and store) with communication (to send and share). ICT overcomes the drawbacks of manual methods:



Manual methods compared with ICT methods.

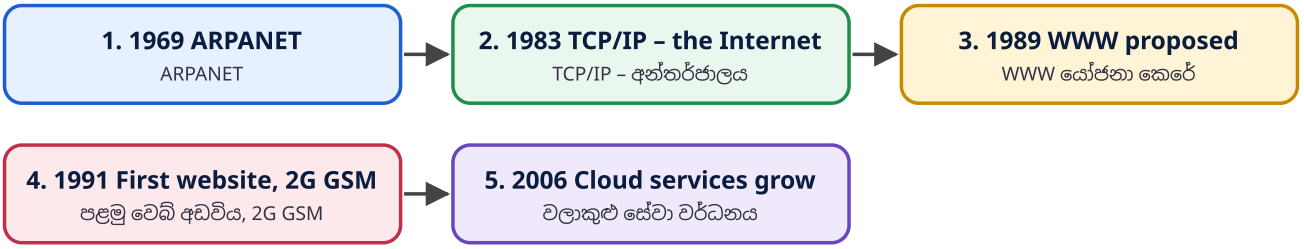
Manual problem	ICT solution

Duplication and inconsistency	One central database used by everyone
Human errors	Validation checks and automatic calculation
Delay	Fast processing and instant search
Poor sharing	Networks, e-mail and the cloud
Poor customer service	Online services 24 hours a day

5. Technologies for retrieving and sharing information

Today we can **retrieve** (find and get) and **share** information using search engines, websites, e-mail, social media, online databases, digital libraries, video calls, SMS, file sharing and cloud storage such as online drives.

6. Networks, the Internet and the WWW



Key steps in the growth of networks and the Internet.

- **Computer network** – two or more computers connected to share data and resources (printers, files).
- **ARPANET (1969)** – an early US research network; the start of the Internet idea.
- **The Internet** – a worldwide “network of networks”. ARPANET switched to the TCP/IP protocols in 1983.
- **World Wide Web (WWW)** – web pages linked by hyperlinks, proposed by **Tim Berners-Lee** at CERN in 1989; the first website went online in 1991.
- The Internet is the network (roads); the WWW is one service on it (the shops on the roads). E-mail is another service.

7. Mobile communication, mobile computing and cloud computing

Generation	Main feature
1G (1980s)	Analogue voice calls only
2G (1990s, GSM)	Digital voice and SMS
3G (2000s)	Mobile Internet and video calls
4G (2010s, LTE)	Fast broadband, HD video streaming
5G (2019 onward)	Very high speed, very low delay, many IoT devices

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Mobile computing means using computing devices (smartphones, tablets, laptops) while moving, connected by wireless networks. **Cloud computing** means using computing resources (storage, software, processing power) over the Internet from a service provider, paying only for what you use. Main cloud service models: **SaaS** (software, e.g. online office apps), **PaaS** (a platform to build apps) and **IaaS** (virtual servers and storage).

> 💡 Cloud is like using the electricity grid: you do not build your own power station, you just plug in and pay for what you use.

8. Information in various domains

Every field uses information: banks (account balances), hospitals (patient records), schools (results), transport (timetables), agriculture (weather and prices), government (census). Part 1.6 studies these domains in detail.

> 🚀 **Beyond the syllabus (2026 update)** *Not required for the exam – read for interest.* **5G and edge cloud.** 5G networks give speeds of over 1 Gbps and delays of a few milliseconds. With **edge computing**, small cloud servers are placed near users, so self-driving cars, remote surgery robots and smart factories can react almost instantly. Satellite Internet constellations also bring broadband to remote areas.

Key Words

Decision making – Choosing the best option using information.

Policy making – Making rules and plans for a country or organisation.

Prediction – Saying what may happen in future using past data.

Monitoring – Checking progress or condition against a plan.

Manual method – Handling data by hand with paper and files.

Inconsistency – The same fact has different values in different places.

Duplication – The same data stored again in more than one place.

Computer network – Connected computers that share data and resources.

Internet – A worldwide network of networks using TCP/IP.

World Wide Web – A service of linked web pages on the Internet.

Mobile computing – Using computing devices while moving, through wireless networks.

Cloud computing – Using storage, software and processing over the Internet and paying for use.

SaaS – Software as a Service: ready software used online.

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Sample Q&A

1. List four ways information is used in day to day life.

> **Answer:** Decision making, policy making, predictions, and planning, scheduling and monitoring.

2. Give three drawbacks of manual data processing.

> **Answer:** Duplication and inconsistency of data, human errors, and delay in processing (also poor sharing and reduced customer service).

3. Give one situation where manual methods are harmful to humans.

> **Answer:** Measuring radiation in a nuclear plant – a robot or sensor is used so that no person is exposed.

4. What is the difference between the Internet and the WWW?

> **Answer:** The Internet is the worldwide network of networks. The WWW is a service on the Internet made of linked web pages.

5. What is cloud computing? Name its three service models.

> **Answer:** Using computing resources over the Internet from a provider and paying for use. SaaS, PaaS and IaaS.

6. Which mobile generation first gave SMS?

> **Answer:** 2G (digital GSM).

MCQ

1. Using census data to decide where to build new schools is an example of:

A. Policy making
B. Data creation
C. Monitoring only
D. Scheduling a train
E. Data removal

2. A student's age is 17 in one register and 18 in another. This problem is:

A. Velocity
B. Inconsistency
C. Validation
D. Cloud computing
E. Timeliness

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3. A clerk does 25 forms per hour. Time for 1,000 forms?

A. 40 hours
B. 400 hours
C. 2 hours
D. 4 hours
E. 25 hours

4. With 2 errors per 100 forms, how many of 1,000 forms may have errors?

A. 200
B. 10
C. 20
D. 50
E. 2

5. Who proposed the World Wide Web in 1989?

A. Charles Babbage
B. Tim Berners-Lee
C. Bill Gates
D. Alan Turing
E. Steve Jobs

6. ARPANET, the early network that led to the Internet, started in:

A. 1989
B. 2006
C. 1991
D. 1969
E. 1945

7. The Internet is best described as:

A. A worldwide network of networks
B. A search engine
C. A single web page
D. A word processor
E. Only e-mail

8. Online office apps used through a browser are an example of:

A. IaaS
B. A LAN cable
C. 1G
D. PaaS
E. SaaS

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9. Which generation introduced mobile Internet and video calls?

A. 3G
B. Landline
C. Telegraph
D. 2G
E. 1G

10. Why are robots used to defuse bombs?

A. For scheduling
B. The manual method is harmful to humans
C. To create big data
D. Robots are cheaper than paper
E. To remove obsolete data

11. Which ICT feature solves duplication of data?

A. More paper files
B. Faster typing
C. A bigger monitor
D. A central shared database
E. A 1G phone

12. Using a laptop on a train with a mobile data connection is:

A. Batch processing
B. Manual method
C. Policy making
D. Data removal
E. Mobile computing

13. Which term means: “Choosing the best option using information”?

A. Prediction
B. Inconsistency
C. Mobile computing
D. Computer network
E. Decision making

14. Which term means: “Making rules and plans for a country or organisation”?

A. Duplication
B. Policy making
C. Cloud computing
D. Monitoring
E. Internet

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15. Which term means: “Saying what may happen in future using past data”?

A. Computer network
B. SaaS
C. Manual method
D. Prediction
E. World Wide Web

16. Which term means: “Checking progress or condition against a plan”?

A. Inconsistency
B. Mobile computing
C. Monitoring
D. Internet
E. Decision making

17. Which term means: “Handling data by hand with paper and files”?

A. World Wide Web
B. Policy making
C. Cloud computing
D. Manual method
E. Duplication

18. Which term means: “The same fact has different values in different places”?

A. Prediction
B. Mobile computing
C. Inconsistency
D. Computer network
E. SaaS

19. Which term means: “The same data stored again in more than one place”?

A. Internet
B. Decision making
C. Duplication
D. Monitoring
E. Cloud computing

20. Which term means: “Connected computers that share data and resources”?

A. Policy making
B. Manual method
C. World Wide Web
D. SaaS
E. Computer network

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Structured Questions

1. Explain how information is used for (a) predictions, (b) scheduling and (c) monitoring, with an example for each. *(3 marks)*

> (a) past rainfall data predict floods; (b) a school makes an exam timetable; (c) a hospital monitors heart rate and gives alarms

2. A clerk processes 1,000 forms at 25 per hour, with 2 errors per 100 forms. A computer does 500 per minute. (a) Find the clerk's time. (b) Find the expected errors. (c) Find the computer's time. *(3 marks)*

> (a) 1000 ÷ 25 = 40 hours; (b) 1000 × 2 ÷ 100 = 20 forms; (c) 1000 ÷ 500 = 2 minutes

3. Describe four drawbacks of manual methods and say how ICT overcomes each. *(4 marks)*

> Duplication – one shared database; human errors – validation and automatic calculation; delay – fast processing and search; poor sharing – networks and the cloud

4. Outline the development from ARPANET to the WWW. *(4 marks)*

> ARPANET started in 1969 as a research network; it moved to TCP/IP in 1983, forming the Internet; Tim Berners-Lee proposed the WWW in 1989; the first website went online in 1991

5. (a) Define cloud computing. (b) Give two advantages and one disadvantage. *(4 marks)*

> (a) Using computing resources over the Internet from a provider, paying for use; (b) access from anywhere; no need to buy servers; disadvantage – needs a reliable Internet connection and data are held by another company

Summary

- Information is used for decisions, policies, predictions, planning, scheduling and monitoring.
- Manual methods cause duplication, inconsistency, errors, delay and poor sharing.
- ICT machines do work that is harmful to humans.
- ARPANET 1969 → TCP/IP Internet 1983 → WWW 1989.
- Mobile generations 1G to 5G; cloud models SaaS, PaaS, IaaS.

MCQ answer key – 1.2

1. **A** – Government rules and plans are policies.
2. **B** – Different values for the same fact.
3. **A** – 1000 ÷ 25 = 40.
4. **C** – 1000 × 2 ÷ 100 = 20.
5. **B** – He worked at CERN.
6. **D** – ARPANET began in 1969.

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7. **A** – Many networks joined by TCP/IP.
8. **E** – Ready software as a service.
9. **A** – 3G brought mobile data.
10. **B** – Safety of human operators.
11. **D** – Data are stored once and shared.
12. **E** – Computing while moving.
13. **E** – Decision making – Choosing the best option using information.
14. **B** – Policy making – Making rules and plans for a country or organisation.
15. **D** – Prediction – Saying what may happen in future using past data.
16. **C** – Monitoring – Checking progress or condition against a plan.
17. **D** – Manual method – Handling data by hand with paper and files.
18. **C** – Inconsistency – The same fact has different values in different places.
19. **C** – Duplication – The same data stored again in more than one place.
20. **E** – Computer network – Connected computers that share data and resources.

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