Cambridge International AS & A Level Information Technology 9626

For examination from 2017

Topic 1.2 Sources of Data

A DIVISION OF
CAMBRIDGE ASSESSMENT

Contents

Introduction

How to use this guide

The aim of this guide is to facilitate your teaching of Cambridge International AS & A Level Information Technology, syllabus topic 1.2 Sources of data. This is part of syllabus topic 1 Data, information, knowledge and processing, and looks at where data is obtained from, and how it is obtained.

Section 1 lists some key terms used in this topic and their definitions. Section 2 provides the basic theory that you will need for teaching this topic, including illustrative examples. Section 3 indicates what your learners need to know, understand, or be able to do for this topic in the examination. Section 4 lists some useful websites relevant to the topic for you and/or your learners to use. Section 4 provides activities for you to carry out with your learners to teach this topic, to consolidate, and to check learning.

Learning objectives

Reading this guide should help you guide learners to cope with the following syllabus learning objectives:

- define static data and give an example
- define dynamic data and give an example
- compare the use of static information sources with dynamic information sources
- define direct and indirect data source
- understand the advantages and disadvantages of gathering data from direct and indirect data sources.

Prior knowledge

Before you begin teaching this topic:

- Make sure you understand the concepts of static and dynamic data, information sources, direct and indirect sources before you begin teaching this unit
- When researching information sources make sure you only look at computing or information technology (IT) resources – definitions of static and dynamic data tend to be the same regardless of the subject being studied, but this is not the case with direct and indirect.

1. Key terms

Word/phrase	Meaning
direct data source	A source where data is collected for a specific purpose or task, e.g. questionnaires or data logging
dynamic data	Data that changes or is updated, e.g. data that can be written back or edited
indirect data source	Data obtained from a third party not necessarily related to the current task
static data	Data that does not change, e.g. that is read from a data source, but not written back

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2. Theory

2.1 Introduction

This unit focuses on where data is obtained from and how it is obtained. We first see that there are two types of data: static and dynamic. We then examine the different methods used to obtain data, and look at the two types of data sources: direct and indirect.

2.2 Static data

2.2.1 What is static data?

Static data is data that does not change during processing: it is either read and not written back to a file or data source, or is not changed when written back.

Examples

- A newspaper story – hardcopy cannot be changed once printed
- Data stored on a CD ROM – a CD ROM cannot be edited.

These are examples of static data/information as they cannot be changed.

2.3 Dynamic data

2.3.1 What is dynamic data?

Note: It is best **not** to start by asking learners to brainstorm 'static' and 'dynamic' or any similar activity, as they may not have come across these concepts before.

Dynamic data refers to data that changes during processing – it is updated as and when necessary. The data is never expected to be the same when re-input.

Examples

- Data on a webpage that is updated from time to time
- Data on a CD RW can be rewritten or edited
- Data from a stock market.

These are examples of dynamic data, as they change.

2.4 Comparison of the use of static and dynamic information sources

Static **data** is what is stored on a CD ROM, but the CD ROM is a static **information** source as we interpret what is on the CD ROM to give us information.

Static information sources	Dynamic information sources
• It is very difficult to add information to a static information source after it has been created • There is a limited amount of information in a static information source • Static information sources are carefully checked for accuracy, as once the data is used it cannot be changed.	• A dynamic information source can have information updated quickly • The data in a dynamic data source is usually up-to-date • There can be many contributors to a dynamic data source such as a website, so the information can be inaccurate.

2.5 Direct data sources

2.5.1 What is a direct data source?

A direct data source is one that data can be gathered from, without having to go to a third party. It gives us data that is often called 'original source data'.

A census is a common direct method of collecting demographic data. A census is usually carried out by a national government which tries to collect details of every person in a country. However, censuses are usually carried out every 10 years and are therefore not the best source of data on births and deaths.

2.5.2 Methods of collecting direct data

Questionnaires
Questionnaires are often used to collect data from individuals. They can be hard copy or completed online. Questionnaires can make it easier to analyse information because all respondents are asked the same questions.

Interviews
Interviews allow you to collect more data from people as responses can be given in greater depth.

Observation
Data gatherers observe what is happening during an activity, then record and analyse the resulting data.

Data logging
This is the use of sensors to produce data that can be gathered and interpreted.

Example – data collection methods

A new high speed train line

The government are investigating the feasibility of introducing a new high speed rail link between the capital and a major industrial city. Before they decide whether to proceed or not, they will need to collect some direct data.

This direct data will include:

- the time it takes to get from the capital to the other city using the existing rail line
- the number of trains and passengers who use the existing rail line
- how many passengers would use the new system
- what people who live on or near the existing route think about the effect it would have on their environment.

Here are some examples of how the data could be collected:

The time it takes to get from the capital to the other city using the existing rail line:

This information can be collected from existing train timetables, however this method would not be using a direct data source. Original data could be collected by actually travelling on trains periodically and timing the journeys, but this might not be practical given the time it would take.

The number of trains and frequency on the existing line:

The suggested method to be used is a data logger. A sensor is placed on the rail line. This sensor is attached to a roadside data logger. As trains pass over the sensor, their speed, time of day, number of carriages and frequency are logged.

The advantage of a data logger is that it gathers physical data automatically.

The number of passengers:

The method could be to use infra-red sensors fitted around each door on the train to count the number of passengers getting on and off the train at each station. From these it can be calculated how many passengers are on the train at any point along its route. The data is fed back to a microprocessor.

How many passengers would use the new system:

This could make use of questionnaires: passengers on the existing route and airline passengers in the capital are asked to complete the questionnaires.

The advantage of questionnaires is that they can be collected and analysed reasonably quickly. The disadvantage is that only a proportion are returned, making the sample size quite small.

What local residents think:

Face-to face interviews would be best. The advantage of interviews is that they may gather some unexpected data and obtain personal attitudes that a simple questionnaire would not. However, it takes time for many interviews to take place.

2.6 Indirect data sources

2.6.1 What is an indirect data source?

Indirect sources means data that was collected for a particular reason but is then used for something else. It often occurs when one organisation collects data about individuals and then sells this data to another organisation.

Example – indirect data sources

Electoral register

This is a list of adults who are entitled to vote in a local or national election. An edited version of the register can be purchased and used for any purpose.

Businesses collecting personal information

Businesses sell the information that they collect from their customers. For example when someone purchases something online they are often asked to tick a box authorising the business to share this with other organisations. Customers often provide personal information that has a commercial value. Businesses use this information to create mailing lists that can be purchased by any other organisation/individual to send emails or even brochures through the post.

2.7 The advantages and disadvantages of gathering data from direct and indirect data sources

2.7.1 Advantages of direct data sources

- Only as much or as little data is gathered as needed
- Exactly where the data came from, and therefore how reliable it is, is known
- There may be an opportunity to sell the data for other purposes
- Gathering data directly addresses specific issues, as the data gatherer controls the methods of collecting the data to fit their needs.

2.7.2 Disadvantages of direct data sources

- Data gathering may be expensive as other companies may have to be hired to get it.
- It may involve having to buy equipment such as data loggers and computers
- It may not be possible to gather original data due to the time of year e.g. winter snowfall data may be required but it is now the middle of summer
- Compared to indirect data sources, using direct data sources may be very expensive in preparing and carrying out the gathering of data. Costs can be incurred in, for example, producing the paper for questionnaires, or the equipment for an experiment
- It takes longer to gather data than to acquire data from an indirect data source
- By the time the project is complete the data may be out-of-date
- The sample size may be small.

2.7.3 Advantages of indirect data sources

- Indirect data sources may allow a larger set of data to be examined using less time and money than direct data collection would require
- The use of indirect data sources allows data to be gathered from subjects (e.g. people) to which the data gatherer does not have physical access
- A larger sample size can be used. Direct data gathering can have limitations due to the availability of the people being interviewed, but by using indirect data sources, the size of the sample can be increased giving rise to greater confidence in the findings
- Using indirect data sources can be done at a relatively low cost, although this varies. Quite often the data can be in an easily accessible location such as the internet whereas for direct data sources, travelling expenses and time taken to collect data can be great
- Information can be of a higher quality. Data collected indirectly has already been collated and grouped into meaningful categories and, for example, poorly-written responses to questionnaires or interview transcripts do not have to be read through to create the data source.

2.7.4 Disadvantages of indirect data sources

- The various purposes for which data was collected originally may be quite different to the purpose of the current research and unnecessary data may need to be filtered out
- There may be no data available – the data required has simply never been recorded
- There may be sampling bias – data from only one section of the community (whether it is based on educational level, level of income etc.) may have been collected but what is required is data from a representative cross-section of the community.

At this point it may be necessary to give a brief outline to learners regarding the coding of information (section 1.4 of the syllabus).

- There may be coding difficulties. For a number of reasons, coding is one of the most difficult tasks faced. The reasons include:

  - the purpose for which the data was originally collected being different to the purpose it is to be used for now
  - different sources resulting in differences in the content
  - lack of standardisation across the required data
  - different sources having different amounts of data.

- If data has already been coded the coding may be difficult to understand
- The data may vary in reliability, depending on who collected the data and how old the data is
- Before using an indirect data source, the reason why the data was collected directly in the first place needs to be known.

3. Exam preparation

This topic requires learners to:

- define static data, clearly identifying that static data is data that is unchanged, and give examples
- define dynamic data, understanding that dynamic data is data that is changed or updated, and give examples
- define direct data source, and understand that this is a source where data is collected for a specific purpose or task
- define indirect data source, and understand that this is data obtained from a third party not necessarily related to the current task
- understand the advantages and disadvantages of gathering data from direct and indirect data sources.

Learners must know and understand all of these terms, as well as advantages and disadvantages of direct and indirect data sources, to be able to answer any exam questions which may come up on this topic.

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4. Further resources

Useful websites

www.teach-ict.com/as_a2_ict_new/ocr/AS_G061/311_data_info_knowledge/ static_dynamic_data/miniweb/index.htm

http://as-ict-ria-yves.weebly.com/direct-and-indirect-data.html

5. Class and homework activities

5.1 Activities for teaching this topic

The following activities are suggested during the teaching of this topic.

5.1.1 Static and dynamic data

It is best to teach static data and dynamic data together in order to highlight the differences.

Borrow some dictionaries from the English department and ask learners (in groups) to look up the definitions.

Then ask them to search for 'static data' and 'dynamic data' on the internet and find definitions and examples. Make it clear that they will need to be careful and find only those sites that give IT/computing definitions.

Note: It is best **not** to start by asking learners to brainstorm 'static' and 'dynamic' or any similar activity, as they may not have come across these concepts before.

Be careful not to get the learners confused between data and information. Reinforce the distinction between these two.

5.1.2 Direct data sources

Ask your learners to search for 'direct data source' on the internet and find definitions and examples.

Be careful not to get the learners confused with data and information. Although these terms are interchangeable when using the term 'source', make sure your learners know the difference between information and data.

Ask learners to brainstorm how data could be collected in order to create a data source (for example, collecting data about learners' exam preparation techniques) and get them to work collectively in groups to write down the advantages and disadvantages of each method.

5.1.3 Indirect data sources

Ask your learners, now they know what direct data is, to brainstorm what an indirect data source is. They then use the internet to find definitions of 'indirect data source', and compare these to their original ideas.

Ask them to brainstorm examples of the use of indirect data sources.

5.2 Activities for consolidating this topic

The following activities are suggested to consolidate your students' learning after they have studied this topic:

5.2.1 Sixty-second challenge – sum up knowledge learned in this topic

Give learners an A4 piece of paper and ask them to write down three things they can remember about different aspects of sources of data. No outside resources such as textbooks, their lesson notes or computers are allowed.

Learners then get into groups of four to compare their ideas and using a side of A3 paper, copy out the relevant points for displaying in the classroom.

5.2.2 The answer is … what is the question?

Prepare a worksheet with a list of answers, leaving space for the learners to write down what they think the question is.

Learners then work in groups to compare answers (the questions) and work together to refine what the questions are. A representative of a group then presents their findings to the rest of the class and receives feedback from the other groups. If their ideas are different, there can be a class discussion on what the questions should be.

5.2.3 Giving wrong answer(s). Why is this wrong?

The teacher asks a question and provides an incorrect answer. The class offer their reasons and reach a consensus.

5.2.4 Describe a word/key idea from the topic with/without using given words.

Learners write down the description of a key word on the topic. They then form groups and the rest of the group has to say what each learner's key word is.

Learners copy out their descriptions and display them on the wall of the classroom (without the key words). Representatives from each group present their descriptions and the matching key words.

5.3 End of topic test questions

1. Explain the difference between static and dynamic data. [2 marks]
2. Explain the difference between direct data sources and indirect data sources. [4 marks]