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of past events. Observational techniques may be structured or unstructured, disguised or undisguised. Furthermore, observation may be conducted in a natural or a contrived environment.[22]

Observation techniques classified by mode of administration

As shown in Figure 5.2, observation techniques may be classified by mode of administration as personal observation, electronic observation and trace analysis.

Personal observation

Personal observation
An observational research strategy in which human observers record the phenomenon being observed as it occurs.

In **personal observation**, a researcher observes actual behaviour as it occurs. The observer does not attempt to control or manipulate the phenomenon being observed but merely records what takes place. For example, a researcher might record the time, day and number of shoppers who enter a shop and observe where those shoppers 'flow' once they are in the shop. This information could aid in designing a store's layout and determining the location of individual departments, shelf locations and merchandise displays.

Electronic observation

Electronic observation
An observational research strategy in which electronic devices, rather than human observers, record the phenomenon being observed.

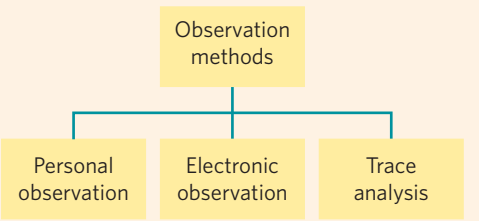
In **electronic observation**, electronic devices rather than human observers record the phenomenon being observed. The devices may or may not require the participants' direct participation. They are used for continuously recording ongoing behaviour for later analysis.

Of the electronic devices that do not require participants' direct participation, the A.C. Nielsen audimeter is best known. The audimeter is attached to a TV set to record continually the channel to which a set is tuned. Another way to monitor viewers is through the people meter. People meters attempt to measure not only the channels to which a set is tuned but also who is watching.[23] In recent years, there has much interest in collecting and analysing television set-top box (STB) data. As television moves from analogue to digital signals, digital STBs are increasingly more common in homes. Where these are attached to some sort of return path (as is the case in many homes subscribing to cable or satellite TV services), these data can be aggregated and licensed to companies wishing to measure television viewership. Advances in distributed computing make it feasible to analyse these data on a huge scale. Whereas previous television measurement relied on panels consisting of thousands of households, data can now be collected and analysed for millions of households. This holds the promise of providing accurate measurement for much (and perhaps all) of the niche TV content that eludes current panel-based methods in many countries.[24]

There are many electronic observation devices that do require participant involvement. These electronic devices may be classified into five groups: (1) eye tracking monitors, (2) neuromarketing, (3) psycho-galvanometers, (4) voice pitch analysers and (5) devices

Figure 5.2

A classification of observation methods



Eye tracking equipment
Instruments that record the gaze movements of the eye.

measuring response latency. **Eye tracking equipment** – such as oculometers, eye cameras or eye view minuters – records the gaze movements of the eye. These devices can be used to determine how a participant reads an advertisement or views a TV commercial and for how long the participant looks at various parts of the stimulus. Such information is directly relevant to assessing advertising effectiveness.

Neuromarketing
The application of neuroscience in marketing, primarily to measure emotions through brain imaging.

Neuromarketing is concerned with the direct measurement of the brain's conscious and unconscious responses to marketing stimuli. Typically this involves the measurement of a participant's brain activity through quantitative electroencephalography (qEEG). This measurement is of electrical activity at specific sites across the surface of the brain through sensors affixed to the participant's scalp. Through knowledge of brain function, insight into the mental activity associated with a particular stimulus or study condition can be determined.[25]

Psycho-galvanometer
An instrument that measures a participant's galvanic skin response.

Galvanic skin response
Changes in the electrical resistance of the skin that relate to a participant's affective state.

The **psycho-galvanometer** measures **galvanic skin response** (GSR) or changes in the electrical resistance of the skin.[26] The participant is fitted with small electrodes that monitor electrical resistance and is shown stimuli such as advertisements, packages and slogans. The theory behind this device is that physiological changes such as increased perspiration accompany emotional reactions. Excitement leads to increased perspiration, which increases the electrical resistance of the skin. From the strength of the response, the researcher infers the participant's interest level and attitudes towards the stimuli.

Voice pitch analysis
Measurement of emotional reactions through changes in the participant's voice.

Voice pitch analysis measures emotional reactions through changes in the participant's voice. Changes in the relative vibration frequency of the human voice that accompany emotional reaction are measured with audio-adapted computer equipment.[27]

Response latency
The amount of time it takes to respond to a question.

Response latency is the time a participant takes before answering a question. It is used as a measure of the relative preference for various alternatives.[28] Response time is thought to be directly related to uncertainty. Therefore, the longer a participant takes to choose between two alternatives, the closer the alternatives are in terms of preference. On the other hand, if the participant makes a quick decision, one alternative is clearly preferred. With the increased popularity of computer-assisted data collection, response latency can be recorded accurately and without the participant's awareness. Use of eye tracking monitors, neuromarketing, psycho-galvanometers and voice pitch analysers assumes that physiological reactions are associated with specific cognitive and affective responses. This has yet to be clearly demonstrated. Furthermore, calibration of these devices to measure physiological arousal is difficult, and they are expensive to use. Another limitation is that participants are placed in an artificial environment and know that they are being observed.

Trace analysis

Trace analysis
An approach in which data collection is based on physical traces, or evidence, of past behaviour.

An observation method that can be inexpensive if used creatively is **trace analysis**. In trace analysis, data collection is based on physical traces, or evidence, of past behaviour. These traces may be left by the participants intentionally or unintentionally. Several innovative applications of trace analysis have been made in marketing research:

- The selective erosion of tiles in a museum indexed by the replacement rate was used to determine the relative popularity of exhibits.
- The number of different fingerprints on a page was used to gauge the readership of various advertisements in a magazine.
- The position of the radio dials in cars brought in for service was used to estimate share of listening audience of various radio stations. Advertisers used the estimates to decide on which stations to advertise.
- The age and condition of cars in a car park were used to assess the affluence of customers.
- The magazines people donated to charity were used to determine people's favourite magazines.
- Internet visitors leave traces that can be analysed to examine browsing and usage behaviour through **cookie technology**.

Cookie technology
An identification code stored in the web surfer's browser that identifies a particular user.

A comparative evaluation of the observation techniques

A comparative evaluation of the observation techniques is given in Table 5.4. The different observation techniques are evaluated in terms of the degree of structure, degree of disguise, ability to observe in a natural setting, observation bias, measurement and analysis bias, and additional general factors.

Structure relates to the specification of what is to be observed and how the measurements are to be recorded. As can be seen from Table 5.4, personal observation is low, and trace analysis is medium on the degree of structure. Electronic observation can vary widely from low to high, depending on the techniques used. Techniques such as optical scanners are very structured in that the characteristics to be measured – for example, characteristics of items purchased and scanned in supermarket checkouts – are precisely defined. In contrast, electronic techniques, such as the use of hidden cameras to observe children at play with toys, tend to be unstructured.

Personal observation offers a medium degree of disguise because there are limitations on the extent to which the observer can be disguised as a shopper, sales assistant or employee. Trace analysis offers a high degree of disguise because the data are collected 'after the fact': that is, after the phenomenon to be observed has taken place. Some electronic observations such as hidden cameras offer excellent disguise, whereas others, such as the use of eye tracking equipment are very difficult to disguise.

The ability to observe in a natural setting is low in trace analysis because the observation takes place after the behaviour has occurred. Personal observation and audits are excellent on this score because human observers can observe people or objects in a variety of natural settings. Electronic observation techniques vary from low (e.g. use of eye tracking equipment) to high (e.g. use of turnstiles).

Observation bias is low in the case of electronic observation because a human observer is not involved. Observation bias is medium for trace analysis. In this technique, human observers are involved and the characteristics to be observed are not very well defined. The observers typically do not interact with human participants during the observation process, thus lessening the degree of bias. It is high for personal observation due to the use of human observers who interact with the phenomenon being observed.

Trace analysis has a medium degree of data analysis bias as the definition of variables is not very precise. Electronic observation techniques can have a low (e.g. scanner data) to medium (e.g. hidden camera) degree of analysis bias. Unlike personal observation, the bias

Table 5.4 A comparative evaluation of observation techniques

Criteria	Personal observation	Electronic observation	Trace analysis
Degree of structure	*	* to *****	***
Degree of disguise	***	****	*****
Natural setting	*****	****	*
Observation bias	*****	*	***
Analysis bias	*****	**	***
General remarks	Most flexible	Can be intrusive	Limited traces available

Key: low = *, moderate to low = **, moderate = ***, moderate to high = ****, high = *****

in electronic observation is limited to the medium level due to improved measurement and classification, because the phenomenon to be observed can be recorded continuously using electronic devices.

In addition, personal observation is the most flexible, because human observers can observe a wide variety of phenomena in a wide variety of settings. Some electronic observation techniques, such as the use of eye tracking equipment can be very intrusive, leading to artificiality and bias. Audits using human auditors tend to be expensive. As mentioned earlier, trace analysis is a method that is limited to where consumers actually leave 'traces'. This occurs infrequently and very creative approaches are needed to capture these traces.

Evaluating the criteria presented in Table 5.4 helps to identify the most appropriate observation technique, given the phenomena to be observed, the nature of participants being observed and the context in which the observation occurs. To strengthen the choice of a particular observation technique, it is also helpful to compare the relative advantages and disadvantages of observation versus survey techniques.

Advantages and disadvantages of observation techniques

Other than the use of scanner data, few marketing research projects rely solely on observational techniques to obtain primary data.[29] This implies that observational techniques have some major disadvantages compared with survey techniques. Yet these techniques offer some advantages that can make their use in conjunction with survey techniques most fruitful.

Relative advantages of observation techniques

The greatest advantage of observational techniques is that they permit measurement of actual behaviour rather than reports of intended or preferred behaviour. There is no reporting bias, and potential bias caused by the interviewer and the interviewing process is eliminated or reduced. Certain types of data can be collected only by observation. These include behaviour patterns which the participant is unaware of or unable to communicate. For example, information on babies' and toddlers toy preferences is best obtained by observing babies at play, because they are unable to express themselves adequately. Moreover, if the observed phenomenon occurs frequently or is of short duration, observational techniques may cost less and be faster than survey techniques.

Relative disadvantages of observation techniques

The biggest disadvantage of observation is that the reasons for the observed behaviour may be difficult to determine because little is known about the underlying motives, beliefs, attitudes and preferences. For example, people observed buying a brand of cereal may or may not like it themselves; they may be purchasing that brand for someone else in the household. Another limitation of observation is the extent to which researchers are prepared to evaluate the extent of their own bias, and how this can affect what they observe. In addition, observational data can be time consuming and expensive to collect. It is also difficult to observe certain forms of behaviour such as personal activities that occur in the privacy of the consumer's home. Finally, in some cases such as in the use of hidden cameras, the use of observational techniques may border on being or may actually be unethical. It can be argued that individuals being observed should be made aware of the situation, but this may cause them to behave in a contrived manner.

CAUSALITY

The concept of causality

Causality
Causality applies when the occurrence of X increases the probability of the occurrence of Y.

Experimentation is commonly used to infer causal relationships. The concept of **causality** requires some explanation. The scientific concept of causality is complex. 'Causality' means something very different to the average person on the street than to a scientist.[30] A statement such as 'X causes Y' will have the following meaning to an ordinary person and to a scientist:

Ordinary meaning	Scientific meaning
X is the only cause of Y	X is only one of a number of possible causes of Y
X must always lead to Y	The occurrence of X makes the occurrence of Y more probable (X is a probabilistic cause of Y)
It is possible to prove that X is a cause of Y	We can never prove that X is a cause of Y. At best, we can infer that X is a cause of Y

The scientific meaning of causality is more appropriate to marketing research than is the everyday meaning. Marketing effects are caused by multiple variables and the relationship between cause and effect tends to be probabilistic. Moreover, we can never prove causality (i.e. demonstrate it conclusively); we can only infer a cause-and-effect relationship. In other words, it is possible that the true causal relation, if one exists, will not have been identified. We further clarify the concept of causality by discussing the conditions for causality.

Conditions for causality

Before making causal inferences, or assuming causality, three conditions must be satisfied: (1) concomitant variation, (2) time order of occurrence of variables, and (3) elimination of other possible causal factors. These conditions are necessary but not sufficient to demonstrate causality. No one of these three conditions, or all three conditions combined, can demonstrate decisively that a causal relationship exists.[31] These conditions are explained in more detail in the following sections.

Concomitant variation

Concomitant variation
A condition for inferring causality that requires that the extent to which a cause, X, and an effect, Y, occur together or vary together is predicted by the hypothesis under consideration.

Concomitant variation is the extent to which a cause, X, and an effect, Y, occur together or vary together in the way predicted by the hypothesis under consideration. Evidence pertaining to concomitant variation can be obtained in a qualitative or quantitative manner.

For example, in the qualitative case, the management of a travel company may believe that the retention of customers is highly dependent on the quality of its service. This hypothesis could be examined by assessing concomitant variation. Here, the causal factor X is service level and the effect factor Y is retention level. A concomitant variation supporting the hypothesis would imply that travel companies with satisfactory levels of service would also have a satisfactory retention of customers. Likewise, travel companies with unsatisfactory service would exhibit unsatisfactory retention of customers. If, on the other hand, the opposite pattern was found, we would conclude that the hypothesis was untenable.

Table 5.5 Evidence of concomitant variation between purchase of a skiing holiday and education

		Purchase of a skiing holiday from a travel company, Y		
		High	*Low*	*Total*
Education, X	*High*	363 (73%)	137 (27%)	500 (100%)
	Low	322 (64%)	178 (36%)	500 (100%)

Table 5.6 Purchase of skiing holiday by income and education

		Low-income		
		Purchase		
		High	*Low*	*Total*
Education	*High*	122 (61%)	78 (39%)	200 (100%)
	Low	171 (57%)	129 (43%)	300 (100%)
		High-income		
		Purchase		
		High	*Low*	*Total*
Education	*High*	241 (80%)	59 (20%)	300 (100%)
	Low	151 (76%)	49 (24%)	200 (100%)

For a quantitative example, consider a random survey of 1,000 participants questioned on the purchase of a skiing holiday. This survey yields the data in Table 5.5. The participants have been classified into high- and low-education groups based on a median or even split. This table suggests that the purchase of a skiing holiday is influenced by education level. Participants with high education are more likely to purchase a skiing holiday: 73 per cent of the participants with high education have a high purchase level, whereas only 64 per cent of those with low education have a high purchase level. Furthermore, this is based on a relatively large sample of 1,000 participants.

Based on this evidence, can we conclude that high education causes a high purchasing level of skiing holidays? Certainly not! All that can be said is that association makes the hypothesis more tenable; it does not prove it. What about the effect of other possible causal factors such as income? Skiing holidays can be expensive, so people with higher incomes may be more able to afford them. Table 5.6 shows the relationship between the purchase of a skiing holiday and education for different income segments. This is equivalent to holding the effect of income constant. Here again, the sample has been split at the median to produce high- and low-income groups of equal size. Table 5.6 shows that the difference in purchasing levels of a skiing holiday between high- and low-education participants has been reduced considerably. This suggests that the association indicated by Table 5.5 may be spurious. It is possible that considering a third variable will crystallise an association that was originally obscure. The time order of the occurrence of variables provides additional insights into causality.