The essential of marketing research

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1. TERM "MARKETING RESEARCH"

1.1. Introduction

Each business operating in accordance with the rules of free market aspires to gain a competitive advantage, create the image of its own brand and make a profit. Developing strategies which enable to achieve such aims would not be possible if it was not for information which, on the one hand, a company is willing to share with the market (promotion), on the other hand, however, information is what a company seeks, collects and analyzes. Such "sucking" of information has been implemented in the company research system. Marketing activities are the basic set of activities drawing on such sets of information. *American Association* defines marketing as: "processes for planning, coordinating and controlling all active businesses operating in the actual and potential market where, through comprehensive and long-lasting satisfaction of customers' needs, company objectives should be achieved" (Malhotra, Balbaki, Bechwati 2013).

1.2. What is marketing research?

The term of marketing research assumes diverse forms of interpretation. One of the definitions states that it is a collection of various techniques and rules for continuous gathering, recording, analyzing and processing information, thanks to which the process of making marketing decisions is significantly easier. The essence of this research is to lower or even fully eliminate risk connected with making decisions in the ever-changing environment (Dietl 1977). As a result, the likelihood of achieving success and increasing sales rises.

Activities undertaken by a company in order to maximize the process of achieving planned strategic aims are defined as marketing research and fit into marketing processes which, according to Kotler (2004), consist of the analysis of marketing possibilities, researching and selecting the target market, designing marketing strategies, drawing up marketing plans, organizing, implementing and controlling marketing activity (Garbarski, Rutkowski, Wrzosek 2000; Prymon 2009; Bielski 1999). Following Kotler the essence of marketing research may then be defined as: systematic planning, collecting, analysis and transferring data and information essential for marketing situation in which a company exists.

A special place in this process is taken by a company manager, a company owner or a company research unit manager. Kędzior and Karcz (2007, pp. 15-17) note two extreme, yet relatively frequent, attitudes of managers with respect to possessing marketing information. The first type comprises people who think that it is important to collect and store as much information as possible from a variety of highly detailed sources in order to reduce the risk of making wrong decisions. The second type of managers gives up seeking and collecting information in exchange for intuitive identification and interpretation of company environment. Both of the above attitudes are dangerous for functioning of a business. In the first case managers forget about making decisions and instead focus on collecting information, which results in losing control of the current operation of a business and competitive advantages. In the second case excessive trust in one's own intuition may lead to making a serious mistake (Kędzior, Karcz 2007, s. 15-17).

Determining the parameters of filtering information and deciding which information is really indispensable for making marketing decisions is currently the most difficult task for company managers operating in " the information age".

Marketing research applies methods developed and used in other scientific disciplines, mainly in psychology, sociology and methodology of science. A lot of methods applied in marketing research systems have been adopted to carry it out. A lot of them have been modified with respect to difficulties arising from methodical and thematic diversity. This kind of research is characterized by the necessity to conduct both qualitative and quantitative analyses (Malhotra, Balbaki, Bechwati 2013,).

The term "marketing research" is interpreted in various ways by various authors particularly with reference to related terms such as market analysis or market research. The following table contains the explanation of the terms.

Table 1.1. Terms related to the term of marketing research

MARKET ANALYSIS	MARKET RESEARCH	MARKETING RESEARCH
A set of activities aiming at creating circumstances for making decisions which relate to market equilibrium (Kramer 2004)	A set of activities leading to the identification of market phenomena, factors and processes, their origins, form and developmental tendencies (Kramer 2004)	A system of filtering, collecting, analyzing and interpreting information improving the quality of decisions made in relation to immediate and distant environment of a company (Więcek-Janka 2010)

Market analysis forms the basis of functioning and plans of each company. Its aim is to investigate and determine possibilities and conditions that must be taken into account by a company in its production, service and trade activities which depend on buyers, suppliers and competitors. Market analysis consists in examining the features and properties of selected markets, partial markets or their segments. It comprises assessment and relations between the total demand of the research market and the offer of the supply of products and services of a company and its competitors. The principal object of the qualitative analysis of the market is: to determine the type and needs of buyers, segments in which they appear, market channels and their participants; to identify competitors and the range of using and the level of effectiveness of marketing instruments. The quantitative analysis of the market comprises its potential size, past and expected growth, market share, the degree of share of significant competitors, the level and planned changes of the price, product innovations.

Illustration 1.1. Market and Marketing Research

Market analysis is a narrower term than "market research". It makes use of data obtained through market research. Market analysis may be defined as a momentary registration of the market structure, namely the structure of market behaviour in a given period (Malhotra, Balbaki, Bechwati 2013; Churchill, Brown, Suter 2013; Sztucki 2000). Market analysis is, in a short-term way, the study of market elements in a given period. **Market research** is a set of activities consisting in collecting information about market phenomena and processes, their causes, current condition and developmental tendencies. The aim of market research is to gain information about the development of market mechanisms such as demand, supply, prices, consumer behaviour and preferences, competitors' activity, functioning of the distribution and selling systems, etc. Market research is part of marketing research. Market research leads to the identification of market phenomena, their origins and developmental tendencies both at the micro and macro scale. Not all market research is included in marketing research and it pertains, in particular, to research of long-term character and at the

macroeconomical scale. Therefore, marketing research should be treated as a system of searching for, filtering, collecting, analyzing and interpreting information, raising the quality of decisions made with respect to immediate and distant environment of a company.

The source literature contains a range of definitions of marketing research. Among the most interesting approaches from the Polish literature are those by Kaczmarczyk (2003), Mantura (2000), Kędzior, Karcz (2007).

Kaczmarczyk (2003) defines marketing research as a set of techniques and principles of a systematic collection, recording and analysis of information which enables to conduct marketing research.

The above definition appears to be relatively narrow, characterizing marketing research as a selection of techniques and research instruments realized according to a given plan, recording obtained data and its analysis. An essential element of Kaczmarczyk's definition is an element of repeating research over time. This systematicity of research allows to capture the dynamics of changes in the observed object.

Mantura (2000) defines marketing research as an act of collecting, processing and analyzing information about the research subject.

Such interpretation of marketing research is a general term and allows to exclude research from the non-market range and include it into the marketing research category (medical examination, geological research, etc.)

Kędzior and Karcz (2007) define marketing research as an objective process of collecting, processing and presenting information for the purpose of making marketing decisions, which is included into the system of marketing information.

A similar definition of marketing research is proposed by Więcek-Janka, who narrows it down to functioning of a company and presents it as a system of filtering, collecting, analyzing and interpreting information, raising the quality of decisions made in a company. The authoress does not limit the use of research methodology to marketing activity only but widens it to cover a broadly understood process of management whose success is determined by optimal decisions.

Companies active internationally operate in the first place by drawing upon internal sources of information connected with their functioning in a given cultural circle, collecting it and comparing with each other, e.g. in agents' reports, business travel reports, internal statistical analyses. As companies grow more and more

international, the need for internal information to be made objective by sources of external information also rises (Mruk 2012).

1.3. Summary

The speed and accuracy of marketing strategies of companies depends on competent information about the overseas market. The need for such information has led in many countries (which play leading roles in the world trade) to set up branches allowing access to searched for data.

Obtained data cannot always be recognized as fully credible with respect to the specific character of high uncertainty connected with the future development of companies' international activity. In order to ensure the high level of efficiency of international marketing strategies, it is necessary to carry out systematic current and predictive research relating to:

- the economic development of the world;
- the economic, social and political development of particular countries and regions;
- development and degree of popularizing selected products, services and technologies in the world market;
- development of particular companies and unions of companies.

The interpretation of long-term development and finding cause and effect relations is carried out through the technique of scenarios and coming up with systems of early identification, comparisons and historical and international analogies.

Control questions

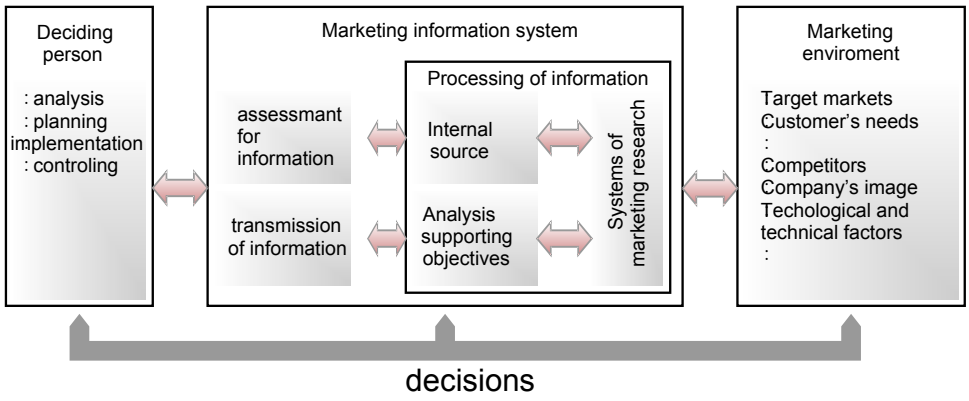
1. Define the term of marketing research.
2. What is a market analysis?
3. What is market research?
4. Discuss the relationships between terms such as marketing research, market research, market analysis.

2. MARKETING INFORMATION SYSTEM AND OTHER DECISION SUPPORT SYSTEMS

2.1. Introduction

A free market, which has functioned in western countries for generations and in Poland since 1989, has been undergoing economic changes characterized by a pattern of alternation between a dynamic development and recession and crisis. The initial chaos marked by uncertainty and a high level of investment risk was followed by the emergence of a relatively stable and competitive market (particularly in trade and services). The period of fast-paced development of the 1990s gave way to the period of stability which was unexpectedly broken by a crisis at the end of the first decade of the 21st century. Nonetheless, a free market is not at risk and its dominating perspective is the internationalization and globalization of its all sectors. Keeping up with changes, generating innovations and showing agility in making decisions under all circumstances appear to be a prerequisite for businesses wishing to operate with a

clear intention to pursue growth. Business performance in the context of free market competition is contingent on making appropriate decisions in all management areas (cf. Nogalski 2011, Prymon 2009). Combining information in the areas of marketing, production, logistics can be effected by the Marketing Information System (MkIS)[1], understood as a coordinated body of people, activities and tools, including computer systems, whose purpose is to generate, store and use data obtained through marketing research. Uncertainty and risk related to market activity can be largely reduced by an adequate composition and structure of the system (Kotler 2004; Kaczmarczyk 2003; Prymon 2009). Functioning of the MkIS is shown in illustrate 1.



Illustrate 2.1. Marketing information system.
Source: Wi□cek-Janka (in: Mantura 2000)

2.2. MkIS and other decision supporting systems (DSS)

The Marketing Information System covers marketing research (Kaczmarczyk 2003, 2006; Churchil 1991; Więcek-Janka 2000, Duliniec 1999). It is an element of the system and its function is to plan, collect, analyze and present data obtained from various

[1]The majority of methods of the classic decision theory is of normative character, i.e. they deal with finding an optimal solution by an ideal decision maker who makes comprehensive use of information that he/she has access to, identifies benefits with the utmost accuracy and acts in a fully rational way. The aim is to make an optimal decision that brings the greatest benefits or reduces the loss.

sources and by means of various methods. Data here is a set of symbols transferred by means of carriers in the form of signs or a combination of signs. Examples include written and oral accounts, audio-video recordings, and digital recordings. Obtaining information from available data is connected with conscious human activity. The change of given data into information will not take place if the recipient is only a machine because information is closely connected with interpretation, that is with a thinking process. Change is possible using inductive and/or deductive thinking as well as analysis and synthesis. The application of so-understood thinking processes is necessary for the correct research process. And so:

- Inductive thinking runs on the basis "from a detail to the general". It means that a researcher ascertains the validity of a thesis on the basis of the validity of effects observed.
- Deductive reasoning is a type of logical thinking which aims to arrive at a specific conclusion on the basis of conditions established earlier.
- Analysis is a process where the entire set is broken down into fundamental elements and characteristics and properties of the analyzed object or phenomenon are singled out.
- Synthesis consists in drawing conclusions based on creating a more complex work out of simpler elements.

Crude data processed by humans into information will be used in decision processes when it is used in the right place, at the right time and by the right person or a group of people. This coordination process of processing and transferring information is what the MkIS deals with.

The aim of designing the MkIS is to optimize the transfer of data and information in the management system, whose purpose is to pursue the company's mission and vision at a given time. An MkIS designer intending to realize the process of optimization should take into account the following factors:

- a set of procedures and methods of regular and planned collecting, analyzing and presenting information used in the process of making marketing decisions,
- an objective analysis of the style of making decisions which fall into the scope of responsibilities of all managers,
- an evaluation of the types of decisions made,
- information needs and the arrangement of such needs in time,
- an optimal format of information provided.

The MkIS should be regularly verified in order to assess the value of information provided and formulate demand for new information. Marketing research results and information obtained from the MkIS complement each other. Due to the need for an effective processing of a large amount of data, the MkIS usually functions using increasingly modern information technologies.

As the competitive market grows, there are more and more decision problems which require information support. Hence, the list of MkIS components is not finite and is being complemented by researchers in this field. The principal MkIS components include (Duliniec 1999, p. 145)

- data sources: internal and external,
- a subsystem of collecting data and entering it into a database,
- a subsystem of developing special reports,
- a subsystem of making routine access to information from an information bank,
- a bank of analytical models and techniques,
- a data bank,
- others.

Marketing Information Systems developed in companies are supposed to fulfill certain functions which, among others, include (Duliniec 1999, p.146):

- supporting a decision process,
- eliminating wrong decisions,
- reducing information losses,
- using effectively available information,
- reducing costs,
- increasing the speed of analyzing problems and making decisions,
- providing information about the surroundings ,
- fulfilling the role of a communication medium with the surroundings.

Another solution which makes it possible to obtain and use information in a company is a decision support system[2]. Decision support systems are a broad category of terms used in organizations and companies. The most frequently used are:

[2]a descriptive approach describes a typical human behaviour in a given decision-making situation. Such an approach is primarily dealt with by psychology, cognitive science and sociology.

- **business intelligence systems** – analytical and decision-making systems in large organizations fed from a "wholesale" repository of data or directly from transactional systems; extract knowledge from available information making use of a base of advanced statistical, optimization models or AI algorithms
- **specialized decision systems** – the role of the systems is to facilitate the use of one or more models applied most often by analysts or to automate a decision process (e.g. in medicine)
- **Intelligent Decision Support Systems (IDSS) -** have been constantly developed since the 1990s of the 20th century, particularly in the areas of the so-called high risk and large-scale critical infrastructures, e.g. for the operators of energy-production networks and for managing large-scale industrial risks and natural calamities. Such systems require cooperation of interdisciplinary teams, many organizations and advanced system technologies, IT, AI and socio-cognitive models.

A decision problem: which system should be used in solving decision questions? They can be solved through the analysis of decision makers' needs. A lot of companies use various decision support systems. Each system available on the market or individually customized has its own strong points. The following table contains the benefits of both systems.

Table 2.1. Comparison of the marketing information system with the decision support system

MARKETING INFORMATION SYSTEM	DECISION SUPPORT SYSTEM
– Standard forms of reporting – Decision makers must disclose information needs and decision-making processes, – File processing in periods determined beforehand – Useful for structured problems – Models specified by a programmer	– Flexible and revolutionary forms of reporting – Users can change information needs and decision-making processes – Interactive processing carried out in real time – Useful for badly structured problems – A dialogue system makes it possible for managers to specify models

2.3. Summary

The MkIS should be created in a way that does not provide redundant or excessive information. Such a construction of systems happens often and results from a badly designed data transfer network and lack of cooperation with decision makers. Data should be precisely evaluated and aggregated in accordance with information needs. Both information users and providers must be aware decisions made and must know information needs at each stage of a decision making process. Both sides must understand each other and watch over common interests. The MkIS should be designed and then treated as a component part of a company whereas marketing research can be commissioned to be carried out by professional firms, which means that marketing research is carried out at an MkIS "order".

Control questions:

- What is the MkIS?
- What are the components of the MkIS
- What are the functions of the MkIS?
- What are decision support systems?
- What is the difference between the MkIS and other decision support systems?

3. OBJECT OF RESEARCH AND CLASSIFICATION CRITERIA

3.1. Introduction

All events occurring in the milieu of an enterprise and inside it, which have any connection with marketing activity, can be an object of research. They can be classified against diverse criteria. The most important ones include an object and subject matter of research, time horizon, continuity, place, method, accuracy and budget (Hague 1999; Kaczmarczyk 2006, Prymon 2009). Research classification criteria are by no means a finite list. Technological advances and regular modernization of Internet tools give rise to new classifications. Nevertheless, the fundamental classification criterion needs to be an object of research, which is present independently of other criteria in each research case (Więcek-Janka 2000).

Table 3.1. Selected research classification criteria along with examples

CRITERION	RESEARCH EXAMPLES
Time	historical, current, perspective
Continuity	continuous, periodic, sporadic

Place	industrial enterprise, trading enterprise, services providing enterprise, institutions operating in the sphere of consumption and trading partners
Method	simulation, survey data collection, statistical, psychological, experimental, etc.
Accuracy	descriptive, quantitative, qualitative
Budget	high, low
Object	product, price, distribution, promotion, demand, competition, etc.

3.2. Object of research

An object of research is understood in this paper as a specific part of reality in which a researcher takes interest and in which the subject matter of research is immersed along with contexts. The subject matter of research should be understood as everything that forms [..] a social reality, that is collective consciousness and social aggregates, institutions, processes and phenomena subject to a detailed research procedure.

3.3. Marketing research classification criteria

Conducting marketing research as a reaction to an information need of decision makers is becoming an increasingly pronounced area in the operation of businesses. Marketing research is classified first and foremost with a view to the character of gathered information and the type of conducted research (Więcek-Janka 2000). Research experience shows that one of the most significant criteria in the selection of a research method is the character of gathered information. Therefore, we divide them bearing in mind the following (Kaczmarczyk 2003; Garbarski, Rutkowski, Wrzosek 2000; Więcek-Janka 2000):

1. Type of research – typical criteria regarding the specific kind of research are:
   - its duration,
   - level of meticulousness and precision,
   - units responsible for conducting research,
   - object of research,
   - degree of interest shown by decision makers.

2. Character of gathered information. One can differentiate between:

a) exploratory research
   - aims at identifying a problem in the simplest way possible,

- facilitates defining research hypotheses,
- determines directions for further activity,
- is applied particularly where a need arises to deepen the identification and understanding of a given phenomenon, process,
- is taken into account where its need is clearly defined,
- the most common ways of conducting this type of research include:
    - analyzing experts' opinions, learning viewpoints presented by specialists in a given field,
    - focus group interviews, conducting interviews in groups of several people to note various opinions,
    - analyzing data from secondary information sources,
    - case study, detailed consideration of selected situations connected with a studied phenomenon,

b) explanation research

- explains the problem and defines its causes,
- requires collecting closely specified information,
- leads to making the most appropriate choice by a decision-maker,
- facilitates making a decision in a situation when various solutions to a given problem are possible,
- is used in the case of fully clear aims,
- covers:
- descriptive research which leads to obtaining a detailed description of the studied phenomenon; this description is not used as a tool for making decisions, but is a perfect source of information about the current condition of the market; there are two variants of this kind of research:
    - cross-cutting research (research whose purpose is the observation of a given phenomenon or object in one specifically chosen period),
    - continuous research (repeatable research, conducted many times in specific spaces of time and always according to the identical research methodology),
- experimental research, i.e. the assessment of cause and effect relations; allows to determine factors initiating a given phenomenon as well as to determine close correlations between these factors.

c) others:

- ad hoc research, conducted at a single client's one-off order, adjusted to his/her specific expectations and needs; hence a popular name of "custom designed",
- panel study, conducted in a continuous way on the same group of people or other objects (households, shops, etc.); every now and then a certain number of research participants may be subject to a random exchange in order to ensure a high quality of results,
- longitudinal research, whose purpose is to observe objects and phenomena in a longer period of time,
- tracking research, conducted systematically in specific spaces of time, similar to a panel study; tracking research, unlike a panel study, is conducted each time on different groups of respondents; the research subject and the questions asked remain unchanged (tracking research can be used to monitor newspaper readership, radio listenership, television viewership, etc.).

Determining an object and subject matter of research is most often done through exploratory research and the analysis of the existing state. It includes a literature study, a case study, pilot research conducted on the basis of a research plan of the preliminary research.

A list of questions whose answers systematize consecutive actions help in continuing research and setting a schedule of explanation research. The list includes the following questions:

- What is already known about the object of research?
- What is the validity of the studied phenomenon?
- Is it important for marketing or management policy?
- Is it important for other reasons?
- What is original about the proposed research solution and suggested hypotheses?
- What is useful about the future research results?

Explaratory research is conducted as auxiliary research in identifying a problem, formulating research hypotheses and determining further directions of research (Kaczmarczyk 2003; Więcek-Janka 2000). Its purpose is to determine at an initial stage the essence of the analyzed situation or phenomenon and the scope of information which needs to be collected during the course of proper research. Such research is used to provide a better understanding of the essence of a given phenomenon or process, e.g. to formulate the causes of a fall in sales of a product.

Explantion research has a close relation with the specified research aim. It is conducted where the scope of necessary infomation is known in order to propose specific solutions to a problem which is being analyzed. The main aim of this type of research is to make it possible for decision makers to choose the best option of solving a problem in known circumstances. This kind of research is useful when multi-optional solutions to definite problems exist and for a decision to be made there is necessary information evaluating each option by means of decision-making rules or specially designed procedures (Kaczmarczyk 2003; Więcek-Janka 2000).
The following table shows the basic differences of a research aim and the scope of collected information.

Table 3.1. Features of exploratory and explanation research (own work)

EVALUATION CRITERION	EXPLARATORY RESEARCH	EXPLANATION RESEARCH
Research aim	identifying a situation or a phenomenon	verification of hypotheses, help in choosing a solution option
Scope of necessary information	unclear	closely specified
Information source	unclear	clearly specified
Form of collecting information	simple, superficial	Ordered
Trial	relatively small, subjective selection	relatively big, objective selection
Information analysis	informal character, qualitative analysis	formal character, quantitative analysis
Conclusions	suggestions	final decisions

3.4. Summary

The aim of marketing research is to facilitate the process of making decisions in the ever-complicated conditions in which companies operate. The tasks of managers who process information that facilitate managing companies include selecting sources, criteria and methods of getting information so that the benefits of possessing information overcome the costs connected with research procedures.

Control questions

1. Explain the terms of a research object and research subject matter.

2. Classify research with respect to its type.
3. Classify research with respect to the manner of collecting data.
4. Characterize descriptive research.
5. Characterize "ad hoc" research.
6. Characterize panel research.
7. Characterize longitudinal research.
8. Characterize tracking research.
9. Explain the difference between exploratory and explanation research.

4. FEATURES, FUNCTIONS AND ORGANIZATION OF MARKETING RESEARCH

4.1. Introduction

Conducting marketing research in the operation of businesses and other organizations is closely connected with their micro and macro environment which was pointed out in the description of the MkIS. Information systems of organizations and businesses contain information needs and their analysis and presentation models.

4.2. Features of marketing research

Conducting marketing research successfully is tied with securing its basic features:

- systematicity, which should be understood as repeating in time or repeating on research units; observing systematicity makes it possible to compare

findings, observe dynamics of change, specify trends (Kaczmarczyk 2003; Więcek-Janka in: Mantura 2000),
- the strength of purpose, which secures the relevance of research; the purpose of research is connected with finding a solution to a decision-related problem (Kaczmarczyk 2003; Więcek-Janka 2000),
- usefulness, secures the utalitarian character of marketing research (Kaczmarczyk 2003; Więcek-Janka 2000),
- extension (more frequently encountered in scientific research) – the result and interpretation of conducted marketing research leads to addressing further, more detailed research problems whose solutions are followed by even more questions, etc.).

The design and execution of research marked by the above features guarantees complementary use of data and information from available sources both in the present and the future of a business.

4.3. Functions of marketing research

In the process of making decisions marketing research fulfills three basic functions: descriptive, diagnostic and predictive.

The predictive function of marketing research consists in foreseeing future events and market processes. Descriptive and diagnostic research forms the basis of foreseeing the results of marketing decision planning. Forecasting research allows to forecast, for instance, the volume of sales of a given product, its market share, the likely influence of the change of independent variable values controlled by a business (product price, advertising and promotion expenditure, product quality, distribution channels, duration of guarantee, product characteristics) on the volume or market share of a product.

The descriptive function of marketing research consists in collecting, analysing and presenting facts, events and market processes. The purpose of descriptive research is to collect and analyse information about competitors, existing competitive products, existing and new markets, retail and wholesale networks, etc. The results of descriptive research create an initial picture of the market situation.

The diagnostic function is a follow-up of the descriptive function. It consists in the analysis and interpretation of data by means of appropriate methods in order to notice correlations between cause and effect and identify regularities present on the market.

The descriptive function shows the market environment (competition, market, etc.). The explanatory function explains the causes and dependencies of the emerging situation. We look for correlations between cause and effect, e.g. we raise the price and assume that something will happen. Therefore, we need to verify it. The forecasting function consists it forecasting future on the basis of what happened in the past (trend extrapolation). The innovative function consists in searching the market for new solutions, changes, opportunities to pursue new tasks. The control function consists in controlling the achievement of an aim, e.g. a promotion campaign, whether the set aim is being met and to what extent.

4.4. Organization of marketing research

Marketing research can be organized in two ways. In the first case it is research conducted by companies to satisfy their own needs. In the second case it relates to research commissioned by companies to be carried out by specialized firms. A lot of companies conduct both types of research at the same time (cf. Rogoziński 1998)

The organization of marketing research is influenced by: the size of a company, its business profile (production, services, trading), its organizational structure. Companies optimize decisions relating to organizing research activity bearing in mind the needs and organization of the remaining functions of a company.

In some companies research units are single-person units, in others they are more developed with a large number of specialists and the location of units responsible for conducting research may be markedly different even in companies of the same business profile.

Marketing research can be conducted at the level of management. It lies within the competence of a marketing manager or it may be conducted by other departments in a company. Both cases have their advantages and disadvantages.

In the first instance the primary disadvantage is isolating researchers from a company's daily business, whereas the advantage is a greater control and coordination of research in a company. The advantage of research conducted by other departments in a company is a more comprehensive use of specialists' skills in specified research problems. The disadvantage is the same research overlapping each other and high research costs.

The disadvantages of both models led to creating a model of mixed organization

combining the advantages of both models. Within the model of mixed organization the superior research unit, featuring the best research specialists, provides assistance and clues to research units at lower levels.

Research units adopt various organizational forms in the organizational structure of companies. The most popular ones include (Churchil 1991, p.31):

- connected with reference domain:
  - brand,
  - stock,
  - market segment,
  - geographical area,
- connected with the currently fulfilled marketing function:
  - sales analysis,
  - advertising efficiency analysis,
  - product planning,
  - analysis of a product place in the life cycle,
- connected with the research method and techniques of analysis:
  - planning an interview, observation, experiment,
  - data clustering, trend analysis.

The existing organizational structure in a company influences the placement and organization of a marketing research unit (sometimes a marketing department). In some companies each department may realize research functions closely connected with the character of its own activity. In other companies research functions are realized by a research department for the whole company. The main advantages of localizing a research department for the whole firm is a better coordination and control or research activity, the reduction of costs and faster planning of companies' operation in various time horizons.

4.5. Summary

Solving decision related problems requires an appropriate organizational structure of research, drawing upon one of the previously defined functions as well as a precise construction of a research process whose part is making sure that the defined features of marketing research are secured.

Control questions

1. List and discuss the features of marketing research.
2. List and discuss the functions of marketing research.
3. Present the ways of organizing marketing research and its place in the organizational structure of businesses.

5. CLOSED CYCLE OF MARKETING RESEARCH

5.1. Introduction

The essence of marketing research is to provide adequate information to specific decision makers in a specific time observing the correct research procedure. In order to perform it, it is important to precisely specify the party commissioning the research and provide it with the research results.

5.2. Closed research cycle

Each type of properly conducted marketing research, taking into account the validity and usefulness of obtained data and information, should meet the requirement of a closed research cycle. A decision maker or another future user of information should take part – to a lesser or greater extent – in the first stage of research design. The research ends when the decision maker is provided and presented with the results. Providing the

commissioning party and parties participating in determining the aim with the research results will secure the minimum level of possible errors connected with the transformation of decision-making problems into research problems. In this way the direct connection of a decision making process and research problem takes place. If this connection malfunctions the research will most likely fail and the money spent will be lost. Examples of acts of decision makers trivializing participation in marketing research design are widely published in source literature (Kaczmarczyk 2003, 2006; Kotler 2004; Churchil 1991, Kędzior, Karcz 2007; Churchill, Brown, Suter 2013).

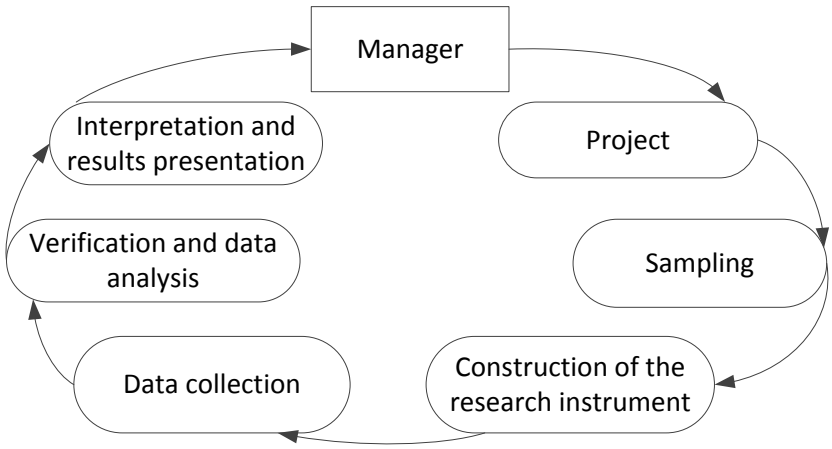


Illustration 5.1. Closed cycle of marketing research (own work)

5.3. Summary

The basis for receiving information, which is useful in company decision-making processes, is cooperation between a research team and decision makers at all management levels.

Control questions

1. Explain the relationship between a decision maker and a party commissioning the research from the point of view of a research process.
2. What does the closed cycle of marketing research consist in?

6. THE SCOPE OF MARKETING RESEARCH

6.1. Introduction

Dealing with the marketing research terminology, market research and market analysis presents certain problems with a precise determination of which category is which. Nevertheless, to systematize and organize research in companies one can differentiate between three main groups: conditions, instruments and results of company activity.

6.2. The scope of marketing research

The scope of marketing research conducted by companies is most often determined by the kind of decisions made. On this basis we can distinguish three basic research areas (Churchill, Brown, Suter 2013; Kotler 2004; Więcek-Janka 2000):

1. Evaluating the company operating conditions which cover:
   - **evaluating internal conditions,** which includes among other things: evaluating techniques and technologies of product manufacturing;

techniques of creating product assortment; organization of a company; evaluating tangible, financial and personnel resources of a company,

- **evaluating external conditions**, which includes among other things: evaluating general operating conditions covering the analyses of economic operating conditions, political conditions and the legal system; the analyses of social and cultural conditions; evaluating the subjective structure of the market covering qualitative and quantitative analyses of competitors, their operating programmers, their strong and weak sides; evaluating demand and supply covering the analyses of the size of the potential market and preferences of recipients and market suppliers,

2. Research of instruments of a company's influence on the market, which covers:

- **research connected with a product**, encompasses, for example, the analyses of relations between recipients' needs and product functions by means of which the said needs can be satisfied,
- **research connected with a price**, covers, among other things, the price flexibility of demand; pricing; strategies for setting competitors' prices and testing prices depending on a product configuration,
- **research connected with distribution,** includes mainly analyses connected with functioning of distribution channels, i.e. the participation of intermediaries in achieving company goals, the participation of distribution channels in affecting the market; the participation of intermediaries in collecting information about the market and its share in the economic result,
- **research connected with promotion**, includes the analyses of the value of promotion budget; efficiency of particular promotion instruments and effectiveness of promotion activity,

3. The research of the results of company operation include:

- **research on sales performance,** includes the measurement and analysis of company's sales revenue across various brackets (products, territory, etc.),
- **research on company's market share**, which for some products is an important indicator of the company's operation results,
- **research on company image,** includes analyses connected with how the company's activity is viewed by clients, intermediaries and other market participants.

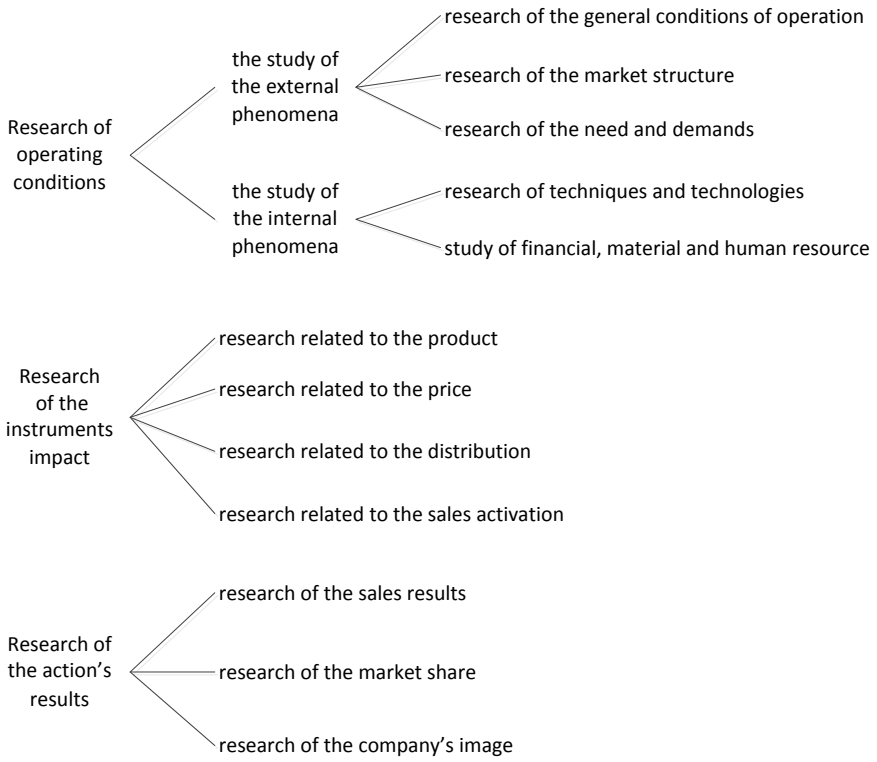


Illustration 6.1. The scope of marketing and market research (own work)

6.3. Examples of research areas in a company

Strategic research aims to reduce the level of uncertainty accompanying the process of making strategic decisions, which are the most important decisions in a company. The level of uncertainty is high because it often takes a long time to notice a problem. Strategic decisions pertain to future options of a company's activity and its likely success or failure. Therefore, the future of the whole company may depend on solving this problem.

Research on market environment is the analysis of factors relating to micro- and macro-environment. General tendencies on the market must be identified as they influence future demand. Chances and risks connected with less immediate environment are determined. It must be ascertained what influence technological changes have in a given field. What are the expected changes in the legal system and how to adapt to them?

Research on market environment includes (Churchill, Brown, Suter 2013; Kramer 2004; Mazurek-Łopacińska 2005):

- the analysis of buyers' behaviour in the process of buying and using goods – Answers are sought to questions like: Who is the buyer? Is he/she rich? What are the factors affecting the decision to buy a product? How can these decisions be influenced? What are the main applications of the product?
- the analysis of competition – it includes the identification of competitors' strategies, aims, strengths, weaknesses and reactions to various market situations. One's own activities and means of rivalling with competitors are adjusted to them. A source of competitive advantage of other subjects is sought. The most important competitors are identified including their market share, prices, power of brand, turnover, profitability, production capacity, planned changes and investments, the quality and availability of products.
- the analysis of distribution structures and development – Intermediaries' motivations and expectations towards the company are defined. It is important to check: What are the negotiation possibilities? To what extent is the producer dependent on intermediaries? Are goods properly displayed? What are the salespeople's skills, features, quality and way of working? Do clients trust them? Are salespeople helpful?

The object of a new product analysis is what exists between an idea to satisfy needs and the act of buying a given good by a client (that is products, services, ideas, places, technological projects). Activities need to tend towards inventing and creating a product, which will meet clients' needs and expectations. New products are to satisfy needs in a better way than those already available on the market and manufactured by competitors. Apart from basic issues such as desired characteristics and properties of a product, it is also necessary to choose an appropriate name, label, packaging and instruments used when introducing a product on the market. It is necessary to analyze products already available on the market and in particular how these products are perceived and evaluated by clients. The starting point in the analysis of a new product is the selection of ideas and choosing the best one. The point is to avoid rejecting an idea which might be successful and accepting an idea which might prove a failure. Therefore, new ideas are subject to multiple evaluations. After the best idea has been chosen, it is

important to design it and make a prototype. Before a product is introduced on the market, it will have undergone testing – first in a company, later in selected groups of consumers.

In the analysis of an existing product and its market position one of the aims is to deepen one's knowledge about the product's use. It is essential to identify present and future preferences of consumers and the offered goods should be compared with the competitive ones. Monitoring of changes that are taking place is necessary so that a company can adjust to them as quickly as possible. Questions asked are: Why is a given product better than the other? What needs to be improved? Analyses are also made with respect to the name, label and packaging as these elements to a large degree determine the level of product acceptance.

The analyses of prices are made when a new product is launched, the level of production costs changes, demand changes or competitors introduce new pricing strategies. Secondary sources of information are used (publications containing data about the levels of retail prices, prices of agricultural produce, levels of exchange rates). Prices of new products are also tested checking in this way buyers' willingness to accept a given level of prices. Analyses of relations between sales income and costs are made. It is to be remembered that a price can be influenced by: the product life-cycle, pricing flexibility of demand, inflation, interest rate, tax and customs burdens, credit availability, credit conditions and prices of competitive products.

Research on the efficiency of communication systems checks:

- whether advertising meets its objectives,
- whether sales have increased as a result of a promotional campaign,
- what reactions a commercial or a press advertisement evokes.

Research on client satisfaction and loyalty gauges the level of clients' satisfaction with the available offer. The level of satisfaction depends on product characteristics, communication policy, clients' experiences, expectations and requirements connected with the product. Monitoring and regular evaluation is vital. For research to be reliable, it is important to choose a diversified group of clients, conduct an interview and take into account the number of complaints made. The loyalty of clients can also be measured by means of questionnaires and interviews. An indicator of shopping repeatability and the number of brands bought is established (the rarer purchase and more brands bought, the less loyal the client is).

6.4. Summary

The presented scope of marketing research often requires the analysis of the market context in which a company operates, which is coupled with widening research to include market research and market analysis.

Control questions

1. Discuss three fundamental areas of marketing research in a company.
2. Discuss research on company operational conditions.
3. Discuss research on instruments of influence of a company on the market
4. Discuss research on the results of company activity on the market

7. COMPONENT PARTS OF A RESEARCH PROCESS

7.1. Introduction

Developing a process of marketing research is tied with determining stages of specific tasks and a timetable of their performance.

In the course of creating a research process we can distinguish between two fundamental phases in which several stages can be identified (Malhotra, Balbaki, Bechwati 2013; Kaczmarczyk 2003; Churchil 1991; Mynarski 2000; Prymon 2009; Więcek-Janka 2000, 2010; Nowak 2010) .

Phase one – conceptual, covers activities which precede the realization of research. It includes the following stages:

- research design,
- sampling,
- method selection and creation of a measuring instrument.

Phase two – research performance covers all activities connected with conducting research and analyzing the results. Three stages can be identified:

- measurement,
- data reduction and editing,
- data analysis,
- presenting the research results.

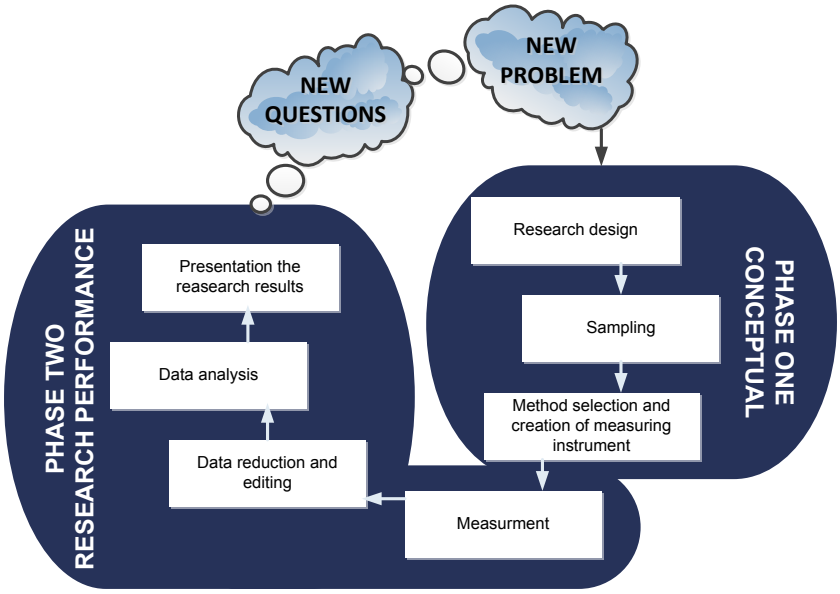


Illustration 7.1. The course of a research process (own work)

7.2. The conceptual phase of a research process

1. Research design

The stage where decision makers' needs are identified and a research team including decision makers (commissioning party) is built. At this stage it is important to focus on identifying decision-making problems, making a list of research areas, identifying research questions and making hypotheses. At this stage it is also important to develop a research timetable and determine a research budget.

2. Sampling

Planning sampling is one of the most important stages of a research process. The basis of conducting research is population that is a statistical population, about which a researcher wants to find out. Sampling then should be carried out in a way that allows to formulate conclusions that relate to the whole population, at the same time limiting research to necessary minimum, which allows to save time and reduce costs.

3. Selection of a research method and creation of a research instrument

The phase of collecting data is started by the analysis of secondary data, which is an important source basis of research. This information is usually analyzed and ready to be used. Using it usually comes down to studying ready-made analyses. The next research step is conducting research using primary sources – they guarantee uniqueness.

Such research consists in the selection of appropriate methods and techniques of obtaining information of strictly defined quantitative and qualitative characteristics. Information comes from observing and interviewing various groups of respondents, that is various companies and institutions. This choice depends on the object of research, the way of communicating with respondents (whether it is possible to get a reply from them), financial means and research costs.

7.3. The phase of research realization

1. Collecting data

The stage, which ends the phase of gathering data, is data collection. It is a technical act which consists in getting to the very source of data and obtaining adequate answers. Since this act is time-consuming and costly, a lot depends on the correct performance of earlier stages.

2. Reducing and editing data

During this stage of the research process the research manager needs to perform activities connected with controlling measurements, reducing and editing data, classifying and tabulating data in order to prepare it for analysis and draw conclusions.

3. Data analysis

At the stage of analysing the obtained data and information what happens is a selection of tools for statistical processing: descriptive, qualitative and quantitative. The use of statistical tools allows to accept or reject hypotheses made at the stage of research design and to prepare recommendations for further research or a variant of solutions. Data analysis uses various measures, indicators and descriptive parameters of statistical population such as: means (arithmetic, geometric, harmonic, RMS), measures of location (modal, median, quartiles, percentiles), measures of variation (absolute deviation, coefficient of variation), flattenings and analyses of correlation and regression. In more advanced research multidimensional analyses are used.

4. Preparing a research report

The final stage of the whole research is the presentation and evaluation of results. Research results are presented in the form of tables and graphs and in the case of numerical data processing in the form of tabulations and various computer printouts, multimedia presentations adjusted to decision makers' preferences and perceptive capabilities.

7.4. Summary

The realization of a research process following a course of activities which, when conscientiously and honestly conducted in a given sequence, guarantee obtaining valuable results and thus allowing to solve decision-making problems in a company.

Control questions

1. What phases does a research process consist of?
2. Discuss the conceptual phase of a research process.
3. Discuss the realization phase in a research process.

8. ERRORS MADE IN A RESEARCH PROCESS

8.1. Introduction

A research process includes seven stages. During each stage more or less serious errors can be made. The sum of these errors may significantly disturb the process of drawing conclusions and jeopardize the quality of solutions that facilitate making decisions. An error in marketing research is a difference between the value obtained as a result of a specific research activity and the real value or value expected by the researcher. The following part of the chapter features the description of error made in a research process (Malhotra, Balbaki, Bechwati 2013; Churchill, Brown, Suter 2013; Więcek-Janka 2010; Kaczmarczyk 2003).

8.2. Errors connected with the stages of a research process

At the first stage of a research process key (systematic) errors can be made, which will markedly limit the possibility of conducting a full research process. The main errors at the stage of research design include: a badly defined research aim, a

decision-making problem inadequately transformed into a research problem, inadequate scope of research, coming up with wrong hypotheses or a wrong formulation of hypotheses. The principal error is, however, the error of a research problem which results from a difference between data necessary to solve a given decision-making problem and data described in a research problem. In order to avoid such an error, it is important to identify and describe information necessary for making a decision (cf. chapter 7).

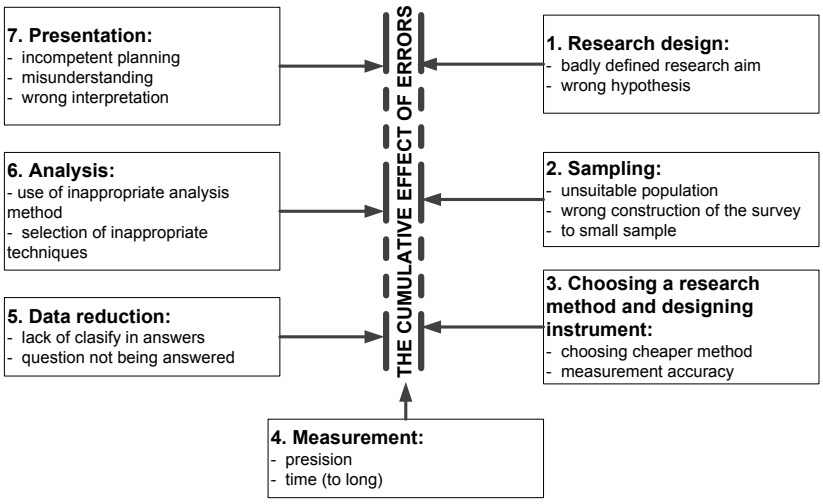


Illustration 8.1. Errors in a research process (own work)

The fundamental error in sampling is to choose an improper statistical population resulting from a difference between population indispensable to obtain necessary data and population looked for by a researcher. Another error is a wrong construction of the survey (a list of populations), which results from a difference between population defined by a researcher and a list of surveyed units. Another error is non-random sampling resulting from a difference between a representative sample and a sample obtained as a result of using the method of non-random sampling. The next error is an inappropriate use of a sample resulting from a difference between the chosen sample and the sample actually used. Another error is for a sample to be too small, which will not ensure the representative character.

While choosing a research method and designing a research instrument it is common to make errors connected with the failure to adjust a research method to research requirements. Most commonly such an error stems from a low research

budget witch is reflected in choosing cheaper methods, e.g. instead of individual or group interviews questionnaires are used. Errors connected with the construction of measuring instruments result from a difference between a result obtained in a given measurement and a result looked for by a researcher. The source of this error may be an inappropriate design of the measuring instrument. This category of errors also includes errors made when using experiment methods. An experiment error arises when the effect of an experimental situation is measured and not only the effect of an independent variable. A special kind of error is the error of a lack of answer referred to in literature as the error of a lack of reaction. It happens when for various reasons the respondent does not answer the questions.

Errors made in research are connected with the reliability and precision of a process. Errors connected with data result from spending too much time on data collection, which leads to a high dispersion of results. Another type of error at this stage of research is caused by an abuse of work by researchers or even cheating.

Data reduction errors result from a difference between results obtained through the use of reduction methods and results expected by a researcher. Such errors result principally from a careless preparation of crude data for further quantitative and qualitative analysis and most commonly are characterized by: lack of clarity and accuracy in answers provided, questions not being answered caused by, among other things:

- omitting entire pages of an interview sheet by the interviewer, by the respondent in the case of a questionnaire,
- refusal to answer certain questions or refusal to take part in a survey,
- fictitious measurement (willful cheating by people conducting the survey),
- inadequate answers (respondents provide answers which are not connected with the subject of the question),
- contradictions and discrepancies (an answer which says that the respondent has never heard of a given product, while when answering another question the respondent claims that he/she uses this product),
- incomplete and ambiguous answers (answers are incomplete, illegible, unclear and ambiguous).

Analysis and interpretation errors result from a difference between data obtained through the use of analysis methods and data looked for by a researcher. The sources of this error might be: the use of inappropriate analysis methods, the

selection of inappropriate techniques for the verification of hypotheses and errors connected with the mathematical apparatus.

Errors in presenting and evaluating results stem from a difference between the research results given by the researcher and information received by the user. The source of error is incompetent planning and presentation. The result is misunderstanding and a wrong interpretation of research results which may lead to making wrong decisions in a company.

8.3. Measurement validity

Data obtained through a research process may be used as long as the measurement is valid. Two aspects of the validity of measuring instruments can be enumerated: **reliability** and **accuracy** (Więcek-Janka 2010).

Accuracy is ascertained on the basis of the fact whether or not the instrument measures the feature planned to be measured and whether or not the research results are free from systematic errors.

Reliability means obtaining the same results on repeating the measurement under the same conditions, thus excluding incidental errors (as above).

The mutual interaction of these quantities is presented at the illustration...

With respect to these two features and their mutual relations we can differentiate:

- Measurements of a high degree of accuracy and a high degree of reliability characterized by a low level of systematic and incidental errors. The results of this research are in keeping with the research aims.
- Measurements of a high degree of accuracy, and a low degree of reliability characterized by a low level of systematic errors but a high level of incidental errors. Since low reliability reduces the level of accuracy, such results do not ensure meeting research aims.
- Measurements of a high level of reliability and a low level of accuracy characterized by serious systematic errors and a low level of incidental errors. The results are not in keeping with the research aims.
- Measurements of a low level of reliability and a low level of accuracy generate both serious systematic and incidental errors. The result of such research is useless from the point of view of a decision maker.

Accuracy is precision with which the instrument measures what is to measure. The most common methods to assess the level of accuracy are (Malhotra, Balbaki,

Bechwati 2013; Churchill, Brown, Suter 2013; Więcek-Janka 2010; Kaczmarczyk 2003):

- Prognostic accuracy. The evaluation of the measurement consists in the confirmation through the further retention of a given feature, which can measured at a later time.
- Diagnostic accuracy. It consists in the calculation of correlations between the measurement results and the development of a given feature measured by means of a different method at the same time.

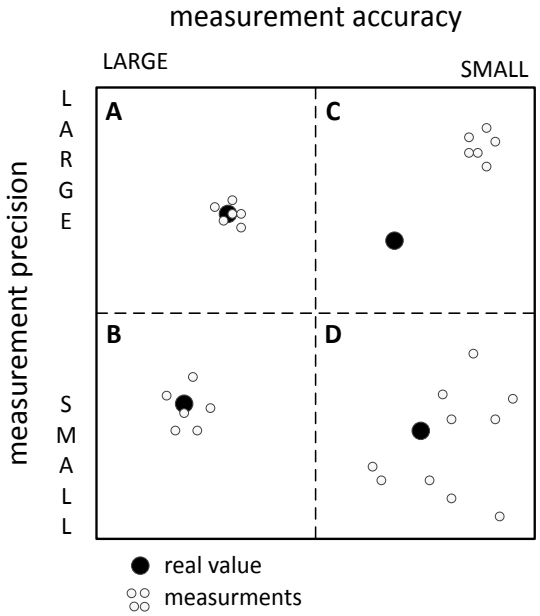


Illustration 8.2. Accuracy and reliability in marketing research. Source: (Kaczmarczyk p.117)

Evaluating the level of measurement reliability is connected with the accuracy and consistency of measuring a given feature. Determining the level of reliability is connected with the use of one of the following methods:

- Parallel measurement method. It makes use of equivalent measurement instruments. Measurement is carried out by means of two instruments in a given time interval. The measurement results are compared, determining the degree of correlation called the coefficient of equivalence. The bigger the

differences between the compared measurements, the lower the equivalence of the measurement.

- A method of repeating a measurement. It consists in repeating a measurement by means of the same instrument under similar conditions. The results are compared with each other, which gives a certain level of correlation called the coefficient of reliability. Its values should be at least 0.80–0.90. The disadvantage of this method is the fact that certain features can be measured only once (e.g. reaction to a new product). Therefore, obtaining another opinion will not be the result of evaluating "this" feature, which the researcher had intended to evaluate.
- Split-half method. According to this method a given instrument is randomly split into two parts, e.g. even positions and odd positions. The obtained halves are treated as separate instruments. The results are compared in the same way as in the previous methods. The obtained result is treated as the coefficient of coherence. The low value of the coefficient means that the instrument is incoherent. For the coefficient to be satisfactory, the instrument should contain at least 20 questions.

8.4. Summary

To error is human. It is important to learn a lesson from errors for the future. Marketing research is a complex process during which at each stage it is important to carefully realize the research methodology and avoid errors, even the least significant ones because each error influences the final result of the research.

Control questions

1. What errors can be made at particular stages of a research process?
2. What variables make up the measurement validity?
3. What is accuracy and how is it measured?
4. What is reliability and how is it measured?

9. RESEARCH DESIGN

9.1. Research design

Research design comprises, first and foremost, the establishment of a research aim. The first task to be realized in a research process is to identify a research problem. This activity consists in formulating questions pertaining to various realms of activity, e.g. buyers' behaviour, the evaluation of the market situation, etc. Answers to these questions may be obtained through the analysis of the situation and through further thematic research (Malhotra, Balbaki, Bechwati 2013; Churchill, Brown, Suter 2013; Więcek-Janka 2010; Kaczmarczyk 2003).

The analysis of the situation (the research context) leads to securing the reality of solving a problem. Such understood analysis of the situation should encompass market analysis, prognosis relating to market development, demand for a firm's products, the analysis of market share, the analysis of profits. It also refers to the analysis of buyers' behaviour and the way of using instruments of marketing mix (cf. the chapter on the scope of marketing research). The analysis evaluates the degree of the importance of the problem, the possibility of solving it, the level of necessary costs and the profitability of the undertaking.

Another activity is to determine a research task which leads to making research subject matter more precise. At this stage the problem is defined, that is expressed in the form of a research problem which helps in creating tools and seeking secondary data. We choose appropriate executors, establish the scope of activities, conditions and deadlines for performance, determine the schedule. The last stage of the design phase is making hypotheses. At this stage assumptions are formed relating to certain presumptions based on theoretical conditions which need to be verified empirically in further research. Also the level of validity and reliability is ascertained.

9.2. A decision-making problem vs. a research problem

The beginning of research must be preceded by **the identification of a research problem**. A decision-making problem (being an initial problem) transformed into a research problem should be accommodated into the context of the situation from which it results, e.g. "Developing packaging for a high-sensitivity device". The decision-making context refers to an extraordinary protection of the device, its marketing attractiveness and usefulness. It leads to developing a range of variants of packaging and the research problem will concern "The evaluation of usefulness and attractiveness of packaging variants". Therefore, the problem must be defined precisely so that it is possible to determine the scope of information necessary to solve it. While identifying a research problem it is important to make use of the results of research conducted while solving other problems of a similar character. Transformation of a decision-making problem into a research problem is shown in illustration 9.1.

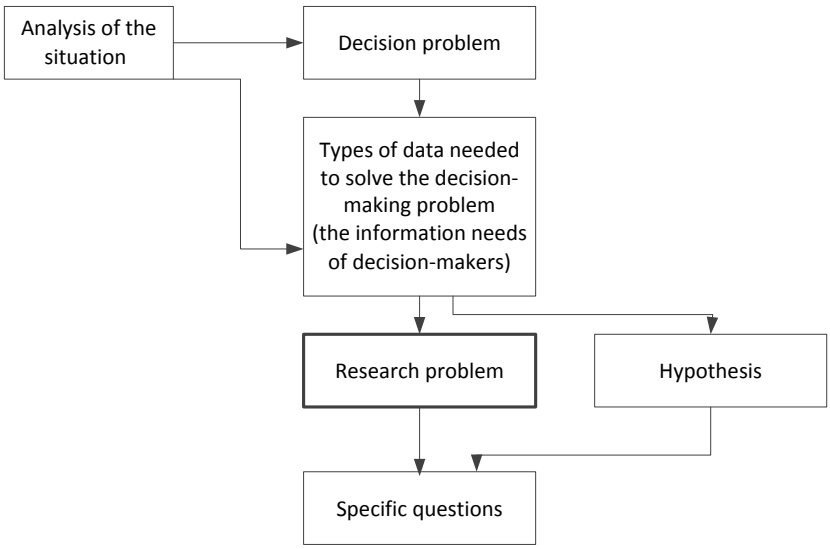


Illustration 9.1. Transformation of a decision-making problem into a research problem. Source: (Kaczmarczyk 2003, p. 59)

9.3. Hypotheses and research theses

Formulating **research hypotheses** is a component part of formulating a research problem. Research hypotheses are certain assumptions, preliminary premises, which are verified through acceptance or rejection. Making hypotheses requires a research problem to be presented in a way that allows to individualize essential relationships and dependencies, which emerge within it. For instance, a hypothesis relating to the above research problem might be: "Attractiveness of packaging will be tied with its low cost of making". The researcher makes a hypothesis based on his/her own experiences and knowledge. The hypothesis suggests that the research is original and the researched phenomenon brings an element of novelty into the already existing knowledge. The hypothesis is divided into:

- Null hypothesis – "majority of women are gainfully employed",
- Alternative hypothesis – "majority of women in Poland are not gainfully employed",
- The main hypothesis is divided into detailed hypotheses, which shows us a variety of social groups (> of women after the age of 65 are gainfully employed – a hypothesis not to be proven).

A thesis is information proven before and subject to the process of falsification by a researcher. This process is connected with conducting research aimed at refuting the results of research carried out in the past, based most commonly on the same methodology which was used to prove that hypothesis.

9.4. Research schedule

The stage of research design may not take place without a detailed description of activities which need to be performed in order to achieve a research aim as soon as possible. A research plan specifies the time financial means needed to conduct research. Some of the methods used are PERT (*Program Evaluation and Review Technique*) or a Gantt chart. This method allows to divide research into particular activities which are assigned time necessary for execution. Next, the degree of how one group of activities is dependent on those previously performed is determined. It allows to plan the sequence and time of each activity. The schedule of research activities is in illustration 9.2. At this stage of research design expected costs incurred during the process of execution should be specified. These include costs of materials, work, transport, business trips, general and other costs which can be classified as research fixed and variable costs.

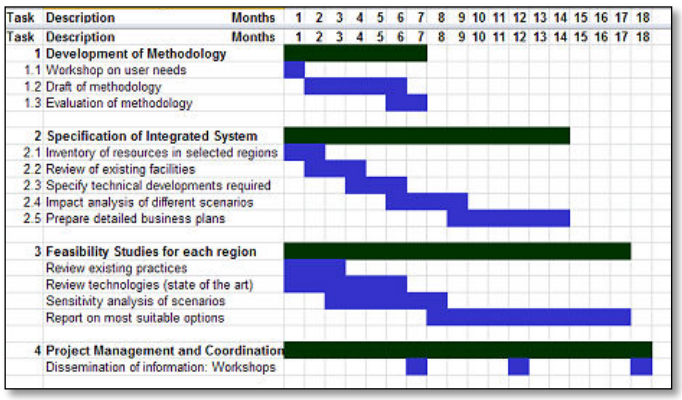


Illustration 9.2. Gantt chart (own work)

9.5. Summary

Research design is the first stage in the process. It requires a careful formulation of aims, problems and hypotheses. The remaining stages depend on determining the

research context and conducting the situational analysis. Therefore, it must be treated as a foundation block of each research process.

Control questions

1. Discuss the activities in research process design.
2. What is a research hypothesis?
3. What is a research thesis?
4. Discuss differences between verification and falsification?
5. Give an example of organizing research.

10. DECISION-MAKING PROBLEM. RESEARCH PROBLEM

10.1. Introduction

Detailed research design is fundamental for the whole research process. At the design stage defining a research problem is the most important element. The original reason for beginning a research process is a decision-making discrepancy connected with the lack of information necessary to make a decision or an excessive amount of such information. The result of such discrepancy is a decision-making problem which should be changed into a research problem.

10.2. Research problem

One of the activities that must be performed at the stage of research design is the diagnosis of the problematic situation resulting from a decision-making problem. The problematic situation should be understood as a state of anxiety expressed by being aware of the lack of knowledge in a given field. The problem is a task (a decision-making situation), which the subject (a decision maker) cannot solve by

means of knowledge possessed. Therefore, a research problem arises through the emergence of emotional and cognitive discord which could be described as: anxiety, uncertainty, protest or interest. In other words, it is a verbal procedure consisting in a precise division of the subjected matter into questions and problems. It is about formulating one or two questions which can be answered with neither "yes" nor "no".

Researchers representing scientific circles treat a research problem as an intellectual stimulus giving rise to a reaction in the form of scientific research (Frankfort-Nachmias, Nachmias, 2001).

A research problem may be established as an affirmative sentence or a question and formulating a problem consists in formulating a question which has not been answered yet or the answer provided is not precise enough. The problem is formulated by means of terms that reflect empirical phenomena. The terms used must be transformed into research variables, which are interpreted as the ones that possess empirical properties and have two or more values, e.g. a company, with respect to its size, may have four values: (1) large, (2) medium, (3) small, (4) micro. A variable having two values is called a dichotomous variable, e.g. (1) woman, (2) man.

In order for a problem to be correctly formulated it should meet a few conditions:

- it must exhaust the range of ignorance of the researcher contained in the research subject matter,
- is should contain all dependencies between variables,
- it should have the potential to be solved empirically and practically.

When formulating a research problem it is important to justify why a given research problem is being taken up. Appropriate arguments should be adduced. They may include:

- the state of knowledge – global and local – relating to the problem (the results of research that has already been conducted – what is already known?),
- new challenges relating to management (what is still not known or what is still controversial?),
- significant importance for management theory or practice (in what way is the research supposed to address the lack of knowledge?),
- the researcher's experiences and interests.

Transforming a decision-making problem into a research problem or specifying it on the basis of a thinking process should run in accordance with the presented regulations. If we decide to specify a research problem in the interrogative form, it will be then, in respect of its logical structure, a question defined below (Nowak 2010, p. 31):

1. Resolutions – begun with particles "do, did", followed by an affirmative sentence;

Such questions allow only two answers: "yes" or "no"; They are always closed questions.

2. Complements (all other questions) may be in the form of:

- open questions (neither the type nor the number of possible answers is prejudged),
- closed questions – the number of possible answers is prejudged.

A research problem must be formulated in a clear, exact and understandable way. Terms must be transformed into variables: dependent – explained and independent – explaining. Moreover, it is important to suggest an answer to a given research problem, which can be verified empirically. Such an answer is called a hypothesis (cf. chapter 9).

10.3. Classifying research problems

Research problems are closely related to a decision-making situation, which is in turn related to difficulties that a decision maker encounters on a daily basis. The following classification of research problems does not exhaust all possibilities, but it orders divisions available in the literature. The basic division includes the following problems:

- Cognitive problems – when an answer to a question asked deepens our knowledge about reality.
- Decision-making problems, referred to in the literature as applied or practical problems – an answer to a question asked allows to make a decision regarding the change of reality (Source: Mazur, 1996, p. 85-91; Adamkiewicz-Drwiłło H.G., 2008, p. 64),
- Scientific cognitive problems:
- exploratory – looking for an answer to questions such as: what is?, what was?, what will be? Solutions to these problems are recognized and documented facts;

- classification – looking for an answer to questions such as: what kind is something? A solution to these problems is a documented statement of properties (features) being looked for;
- explicatory – looking for an answer to questions: what depends on what? A solution to these problems is a documented statement about the existence of relationships which are being looked for.
- Scientific decision-making problems:
- postulative – looking for an answer to questions such as: What needs to be achieved? Solving these problems is carried out by specifying aims;
- optimizing – looking for an answer to questions such as: How to achieve the aim? Solving these problems is carried out by pointing out the ways to achieve aims;
- realization – looking for an answer to questions such as: What needs to be used to achieve the aim? Solving these problems is carried out by doing what is necessary to do in order to achieve the aim.
- Explanatory problems (explaining) – we answer the question "Why is it the case?", e.g. Why is leadership going through the crisis of values?
- Verification problems – we have some ideas (hypotheses) why something is the case and we verify it, e.g. The leadership crisis is connected with the lack of general social values in training managers.
- Descriptive problems – we describe a fragment of reality that we take interest in, e.g. Shaping leadership in the Ministry of Treasury in Poland.
- Prognostic problems – we analyze what will change and in what way.
- Design problems – what to do to obtain a specific result.

A researcher in the process of designing research most often creates hybrids of research problems, trying to describe, explain and prognoses analyzed phenomena or properties. It is a similar case in scientific research. Researchers try to use time and resources in order to combine in research processes exploratory, classification and explicatory problems.

10.4. Summary

A research problem as a main question that a researcher answers determines the whole research process. A badly formulated question will lead to obtaining results which are utterly useless in solving a decision-making problem. (cf. chapter 8).

Control questions

1. Classify research problems.
2. Discuss scientific research problems.
3. Discuss scientific decision-making problems.
4. Construct a research problem for the following decision-making problems:
   - The company Alfa has a financing surplus resulting from profit made in previous years. The management board is considering the best options to use it.
   - The County Office has received an EU subsidy for the development of culture. Which institutions should receive it and in what proportion?

11. SAMPLING

11.1. Introduction

The second stage of a research process is sampling. Designing research with the identification of a research problem and hypotheses is not enough to secure the representative character of research. Representativeness is a sampling feature which allows to generalize research results and apply them with reference to the whole researched population. In other words, the task of a researcher is to choose a part of population that will secure that feature.

11.2. Tasks realized with sampling

Sampling from a population specified in a list (a list of all population units) is an essential part of a research process because on the basis of the results of sampling conclusions describing the whole aggregate are formulated.

Before a researcher selects units to be analyzed, he/she determines the sequence of activities connected with adequate sampling.

The basic activities include:

– determining research population, determining a unit,

- determining a list of research population,
- selecting a method of sampling,
- determining sampling size,
- sampling.

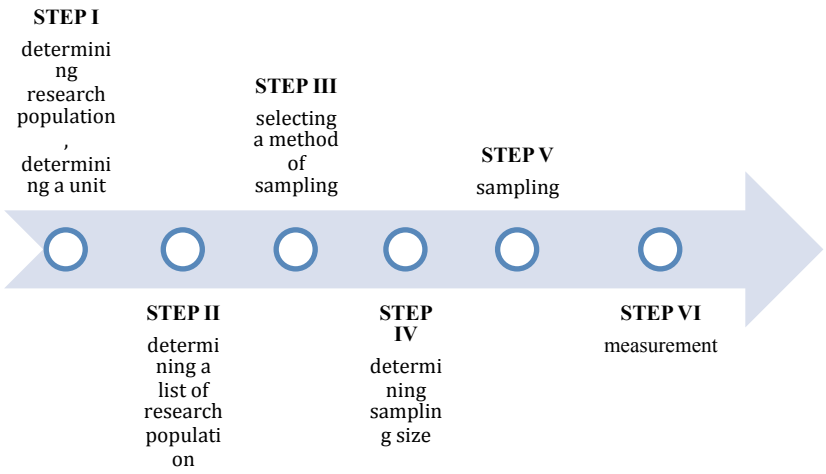


Illustration 11.1. Sampling process (own work)

11.3. Terms connected with sampling

The fundamental terms connected with sampling are: population, sampling unit, report, sampling method. Not knowing them makes it hard to operate comfortably in research procedures. Sampling is selected from a population, being a known, finite aggregate, about which a researcher wants to get specific information. A sampling unit may be simple (individual), e.g. a respondent, an employee of a given department, a product. An example of a complex unit may be: a stock of a production company, a company with the whole production, commercial and personal structure and, for instance, a spatial plan of a production or unloading hall.

The selection of a sampling unit requires this unit to be precisely specified, e.g. exact data: addresses, telephone numbers, fax numbers, e-mail addresses.

A list, that is a research report (a list of all population units) must be created in accordance with the following principles (Malhotra, Balbaki, Bechwati 2013; Churchill, Brown, Suter 2013; Więcek-Janka 2010; Kaczmarczyk 2003):

- appropriateness – a list should faithfully reflect research population including its topicality,
- completeness – a list should contain all units of research population,
- exclusivity – each element of population should appear only once,
- precision – a list may not contain units which do not exist or do not belong to research population.

Drawing up a report of research population without observing the above-mentioned principles often becomes a source of a lot of errors, which will influence next stages of research.

Due to usually too modest financial resources earmarked for marketing research in companies, it is critical to determine how large a sample needs to be in order to draw conclusions relating to research population. There are a lot of methods of the statistical evaluation of the size of a sample. In market practice for companies' research needs sample sizes for particular research subject matter have been developed and presented in table 11.1.

Table 11.1. Sample sizes used in various types of marketing research
Source: Kaczmarczyk 2003, p. 74.

TYPE OF RESEARCH	TYPICAL SIZE	MINIMUM SIZE
Market study	1000 – 1500	500
Strategic study	400 –500	200
Market test	300 – 500	200
Test of a product concept	200 – 300	200
Test of a name variant	200 – 300	100
Packaging test	200 – 300	100
Test of a TV commercial	200 – 300	150
Test of a radio commercial	200 – 300	150
Test of a press announcement	200 – 3000	150
Focus-group interview	8 - 12/region	8/region

The size of a sample is determined by a lot of factors. The most important of these is an estimated admissible error. The size of an error in relation to the size of a sample is assessed through the tables of the size of minimum samples for a given population and an admissible error.

Sampling methods are divided into methods of random sampling and non-random sampling (Kaczmarczyk, pp. 73-78). In random sampling selecting units from a population report depends on a coincidence.

The most often random sampling methods are (Hague 2002; Frankfort-Nachmias, Nachmias 2001; Mazzocchi 2008):

- Simple random sampling, carried out by means of random numbers. To randomize most numbers (e.g. several hundred and more) four-digit tables of random numbers are used. The disadvantage of this type of randomness is a failure to ensure the representative character of the sample as the sample may include incidental units, which do not have to fully characterize the population.
- Systematic random sampling which consists in dividing a population report into equal intervals. For instance randomizing a sample for individual interviews will look like this: determining a sample n = 100 of company representatives out of 1000 – element list (N) requires this list to be divided into 100 equal intervals (k), where:

$$k = \frac{\mathrm{N}}{\mathrm{n}} = 100$$

A number is randomly chosen from the first interval, each next number is randomly chosen every *k*. If the unit drawn is e.g. 3, the next drawn numbers will be: 13, 23, 33, 43 etc. This method is used with large lists and large samples.

Out of non-random sampling methods, the most common to be used in marketing research are:

- A method of typical units sampling, which consists in selecting simple or complex units, which are considered to be typical (average) units. An example might be households of medium financial standing and medium-sized companies. This method is often used in preliminary stages of explanatory research, pilot measurements, evaluation of a questionnaire design. The advantage is its low level of representativeness (often selection is conditioned by the ease and comfort of use by a researcher) even in relation to the method of simple random selection.
- A method of quota sampling which is based on the assumption that the sample must be representative for all population elements. Hence, the structure of the sample due to specific features is the same as the structure of the researched

whole. Sampling is carried out in the following sequences (Hague 2002; Frankfort-Nachmias, Nachmias 2001; Mazzocchi 2008; Kaczmarczyk 2003):

– Research population is divided into groups (strata) according to specific, essential characteristics – criteria, such as e.g. company size, number of employees, number of implemented innovations, scope of production, etc. Sampling requires the knowledge of the structure of research population.
– Having specified the strata, it is important to specify the percentage share of selected strata in research population. Next, the composition of the sample is determined proportionally to the share of particular strata in population. The components of particular strata in the sample are called quota.

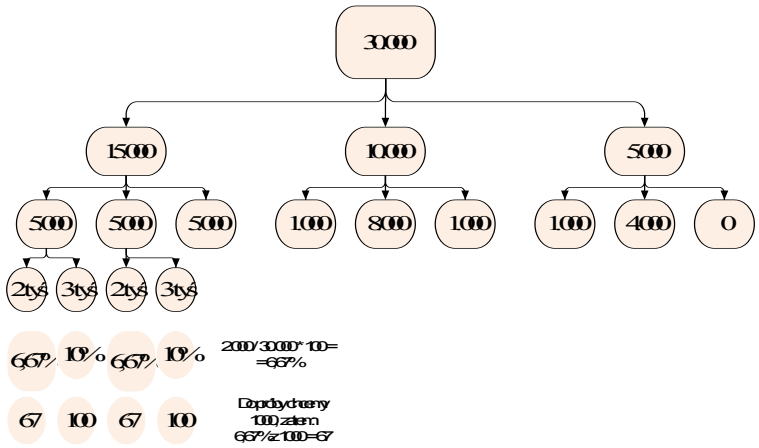


Illustration 11.2. Quota sampling method (own work)

Correct sampling consists in a precise development of instructions relating to random and quota samples. The more precise the instructions, the lesser the probability of making errors in sampling.

11.4. Stratified sampling and quota sampling

Stratified sampling consists in dividing the whole general population into the so-called strata and directly drawing independent samples within each stratum. Dividing population into strata must be conducted in a way that permits each element to enter and stay in only one stratum. This method allows to prevent selecting inadequate random samples from the whole, in which we can observe a

high level of dispersion of analyzed properties. In comparison to random sampling this method is characterized by a higher level of accuracy of the results while observing the same sample size.

There are three randomization techniques applied in particular strata (Hague 2002; Frankfort-Nachmias, Nachmias 2001; Mazzocchi 2008; Kaczmarczyk 2003):

- proportional sampling, consists in selecting from each stratum a number of elements which are in proportion to the size (share) of this stratum in the whole population,
- non-proportional sampling consists in distinguishing strata in general population which are not represented enough in a sample (their share in population is not large), and next selecting from each stratum such a number of elements which is in proportion to the product of the stratum size and standard deviation of the analyzed property in a given stratum[3].
- Optimal sampling is a technique in which from particular sampling strata a number of elements are drawn which are proportional to the product of the stratum size and standard deviation of the analyzed property in a given stratum.

Quota sampling is based on the assumption that a sample is representative for all properties that the researcher is interested in if its structure based on several essential characteristics is identical with the structure of the general whole. In other words, quota sampling is based on how well we know the structure of general population (the so-called control variables) and its projection on the structure of a sample. The segmentation size of a sample may be determined on the basis of multiplying the percentage of the selected properties in general population by the general size of a sample. The more distinguished properties as control variables, the more segmentation divisions and the more difficult the process of completing the right composition of a sample.

[3]This procedure is intuitively correct, since the representation of the layer with a higher dispersion of the characteristic requires more components in the sample than for the smaller scattering layer, while the higher layer should be drawn more test.

11.5 Summary

In sampling, as it has been pointed out before, two features are important: size and representativeness. The size determines the numerical aspect of a sample and relates to the selection of a small sample (due to a high cost of conducting research) but at the same time allowing to present general conclusions relating to research population. Representativeness secures qualitative and quantitative aspects, securing the representation of all important research groups and units.

Control questions

1. What is research population?
2. What is a technical report?
3. What features should be secured by the researcher in creating a technical report?
4. Enumerate and describe sampling stages.
5. Discuss the main groups of sampling methods.
6. What does simple random sampling consist in?
7. What does systematic random sampling consist in?
8. What does typical units sampling consist in?
9. What does quota sampling consist in?
10. Describe the differences between stratified sampling and quota sampling.

12. SELECTION OF METHODS, TECHNIQUES AND TOOLS IN MARKETING RESEARCH

12.1. Introduction

Data facilitating the process of making decisions in a company is sought after in both marketing information systems and dialogue systems. Because of research budget the key question becomes the selection of sources, methods and a research instrument (Malhotra, Balbaki, Bechwati 2013; Churchill, Brown, Suter 2013; Więcek-Janka 2010; Kaczmarczyk 2003).

In marketing research a research method should be understood as a broad way of obtaining information through executing a specific sequence of activities in order to find out about a phenomenon. It encompasses the totality of a researcher's activity aiming at solving a specific scientific problem.

A research technique specifies the type of method used, which allows to obtain true information, opinions and facts. A tool is an object which is used to carry out a given research technique (e.g. a specific set of questions).
Research methods can be divided into two basic groups:

- Idiographic methods, describe phenomena without a precise explanation. They are used sporadically (analysing an individual phenomenon) without looking for general laws.
- Nomothetic methods, tend to explain phenomena and form a basis for creating generalities, laws and theories.

12.2. Sources of information

Marketing research uses two sources of data: secondary and primary. Secondary sources are characterized by easy availability without the need to carry out one's own expensive research. The advantage of primary research is its originality and non-availability by competitors operating on the market. The original research usually serves to precisely describe a given problem.
Secondary measurements are based on secondary sources and consist in collecting internal data, e.g. collecting, studying various secondary sources within a firm and collecting external data consisting in searching for and buying databases and information from market information agencies.
Primary measurements make use of primary sources and are divided into four measurement forms:

- primary indirect surveys (e.g. a questionnaire, a telephone interview),
- primary direct surveys (e.g. a personal interview, a group interview, observation methods, panels),
- experiments: laboratory (e.g. an auditorium test), field (e.g. a standard market test),
- simulation methods (e.g. extrapolation techniques).

The selection of a measurement form is of key significance in design, but it also influences the success of research because it determines the type and value of obtained information. The classification of primary and secondary research is presented in table 12.1.

Table 12.1. Principal national sources of information

Primary research	direct research and treatments (company results and reports, questionnaires, personal interviews, mail and telephone interviews)
	observations
	experiments (tests, simulations)
	heuristic methods
Secondary research	statistical and professional annals
	statistical annals of voivodships
	statistical information (monthly, quartlerly)
	statistical treatments (e.g. internal market)
	specialist publications of the Central Statistical Office, the Military Intelligence Service, e.g. results of general census, reports
	publications and reports of organizations, associations, societies, scientific centres
	publications and treatments
	publications in the mass media
	trade fair catalogues (POLAGRA, Poznan Trade Fair, etc.)
	Public Opinion Research Centre CBOS, OBOP, TNS Global, CWT, EUROSTAT, etc.

12.3. Characteristics of main measurement methods and techniques

A survey is still the most common and widely used method of gathering information in marketing research. By means of a survey a researcher obtains information in the written form as answers to questions. Here, a useful tool is a questionnaire (often used as an auxiliary tool also in interviews) which contains a series of questions answered by a respondent.

The main techniques used in this method are:

- a mail survey,
- a press survey,

- a telephone survey,
- a radio and TV survey,
- a computer (internet) survey,
- an auditorium survey,
- a generally available survey and many others.

Interviews belong to a group of methods of collecting information based on the process of mutual communication. An interview is a special kind of conversation whose aim is to obtain a given set of information. In an interview the most important role is played by a respondent whose answers constitue the basic source of information. A researcher records the respondent's answers. Direct interviews are divided into simple and more sophisticated ones; standardized and non-standardized. Standarization reflects itself in a specific degree of uniformity and precision of a measurement instrument and the way of conducting an interview. The greater degree of interview standarization, the less freedom for the person conducting an interview and the greater role played by an instrument (e.g. a questionnaire). Measurement techniques in interviews are (Malhotra, Balbaki, Bechwati 2013; Churchill, Brown, Suter 2013; Więcek-Janka 2010; Kaczmarczyk 2003):

- a direct individual interview,
- an indirect telephone interview,
- a direct in-depth interview,
- a direct focus interview.

Observation, as a method of collecting data, consists in making observations in a way which is intended, planned and systematic in order to find answers to specific, clearly defined questions. The person who makes observations is an observer. The object of observation can be both individuals, groups of people, their behaviour, objects, companies, markets. For collecting data, specially designed sheets (observation logs) and/or cameras or voice recorders are used. There are three observation dimensions: uncontrolled and controlled observations, overt and covert observations, non-standardized and standardized observations. Measurement techniques cover the following observations:

- direct,
- indirect,
- overt,
- covert,

- participating,
- non-participating and their hybrids.

Projection methods are exclusively used to obtain qualitative information in which questions or stimuli directed at a respondent have an indirect form. A respondent, evaluating attitudes, motives, behaviour of others, subconsciously assigns to them his/her own traits. A mechanism used here is called projection (subconscious transfer of one's own traits onto people or things). In this way consumer traits, particularly pshychological ones, are measured. Techniques used in projection measurements are:

- a word association test,
- a sentence completion test,
- a drawing test,
- a product acceptance test,
- a price acceptance test,
- Brand Party Game,
- a balloons technique,
- a 6 hats test and many others.

Heuristic methods (creative thinking) are mainly used in making subjective prognoses and are a source of qualitative information. The brainstorming method is a method of group thinking or, in other words, generating new ideas like in the Design Thinking method. The Delphi method is a series of surveys aimed at a specifically selected group of experts with a view to obtaining congruent opinions and attitudes regarding the future development of phenomena and processes which are the object of research. A method of expert appraisals is used in building prognoses, whose basis are expert written or verbal utterances matched in a purposeful way. Measurement techniques in heuristic methods are:

- brainstorming,
- Delphi interview (Dalkey, Helmer 1963),
- expert appraisal.

12.4. Advantages and disadvantages of selected research methods

The selection of a research method takes place on the basis of both an objective evaluation of usefulness, when solving a decision-making problem, and the amount of

research budget and it consists in the analysis of advantages and disadvantages of the method.

Table 12.2. Main advantages and disadvantages of selected research methods (own work)

Research method	Advantages	Disadvantages
A survey (indirect) sent by post, over the Internet, general, press etc.	– Low cost – Wide range – Speed and ease in reaching particular social groups – Elimination of interviewer influence	– Low percentage of the return of completed questionnaires – Incomplete representativeness of a sample – Possibility to misunderstand answers
Telephone interview	– Simple method – Low cost – Speed – Ease in reaching a selected sample	– Lack of time for complicated questions – Limited problematic aspects of research
Direct interview	– Current control possible – Exact answers – Possibility to use longer questionnaires – Possibility to conduct simultaneous observation – Possibility to individualize a conversation with respondents	– High costs – Risk of hurried execution of research – Errors resulting from the influence an interviewer has on a respondent – Unwillingness of some respondents to provide answers
Experiment	– Objectivism – Possibility to bring up behaviour which is infrequent and which would require a very long observation – Possibility to bring up desired behaviour several times – Verification of results	– Isolated conditions – may give an impression of artificiality – Not all types of behaviour may be brought up artificially – Research ethics – one must not conduct experiments which may cause durable changes in a child's psyche – Limited application (e.g. in teaching) –

Projection methods	– Allow to obtain answers which would be difficult to obtain from respondents if they knew the research aim – Efficient when researching socially sensitive problems, too personal problems or too abstractive in relation to the knowledge passed by respondents – allow to get to know hidden motives, convictions and attitudes, which could not otherwise emerge	– Necessary for researchers to have wide experience – Require hiring qualified interpreters to analyze answers – High risk of inadequate interpretation of data – High costs – May present respondents with too high demands
Heuristic methods	– Discovering and creating new things and phenomena, – Solving problems in a creative way, – Supporting the creative process and developing features tied with it, – Detecting relations between facts, – Seeking the truth in an autonomous way, – Making hypotheses,	– Lack of guarantee to obtain the best solution

12.5. Summary

The selection of an appropriate research method, from the point of view of a research aim and research budget, is another key decision that a researcher has to make. In the first part of exploratory research available secondary sources are used whose exact analysis confirms a researcher's conviction of the validity of research or forces him/her to reformulate a research aim. The selection and execution of research by methods using primary sources requires discernment and the ability to foresee difficulties that the selected research methods may encounter.

Control questions

1. Discuss the division of methods into idiographic and nomothetic.
2. What are secondary sources of obtaining information?
3. What are primary sources of obtaining information?

4. What survey techniques do you know?
5. What interview techniques do you know?
6. What observation techniques do you know?
7. What projection techniques do you know?
8. Discuss the advantages and disadvantages of using research methods that you know.

13. CONSTRUCTING RESEARCH INSTRUMENTS

13.1. Introduction

The choice of a method and technique of conducting research is an introduction to developing a research tool. The main point is to secure the validity of a measurement tool so that it will measure the feature that a researcher takes interest in (cf. chapter Errors in a research process).

13.2. The process of constructing a research instrument

The choice of a research method and technique made by a researcher determines the construction of an instrument which a researcher will use. It takes three stages to construct a research instrument (Malhotra, Balbaki, Bechwati 2013; Churchill, Brown, Suter 2013; Więcek-Janka 2010; Kaczmarczyk 2003):

- creative (conceptual), in which a researcher develops a measurement tool,
- testing, where the usefulness of a tool is assessed (pilot study),

– real.

Source literature contains a division into two fundamental groups of tools: natural and unnatural (artificial). Each of these groups features a range of tools used in the past and in the present. This does not mean, however, that the list of tools is exhausted, quite the opposite. Changes in measurement technologies lead to creating new tools, e.g. remote research using new computer interfaces. The following table shows research instruments and their application in the first decade of the 21st century.

Table 13.1. Classification of measurement instruments (own work)

Type of instrument		**Name of instrument**	**Examples of instrument application**
Natural measurement instruments		sight, hearing	observation methods, studying and selection of data from secondary sources
		sight, taste, smell, touch	presentations, trying and evaluating product samples
Unnatural measurement instruments	conventional	questionnaire	Surveys, individual interviews,
		test	projections methods, experiments,
		log	panel methods, observation
		instruction	observation methods, interviews
		other conventional instruments	
	modern	camera	observation
		computer	simulation methods
		Internet	personal interviews
		EEG,	physiological analysis of brainwaves
		EMG,	Physiological analysis of muscle contractions
		Eye Tracker, EOG	eyeball movement

13.3. Conventional tools

Questionnaire

In every-day marketing research a questionnaire is still the most popular tool. It can be used in the two methods previously described: a survey and an interview. The first one is given to a respondent to complete, the second one is used by interviewers as a plan for asking questions and is completed by them.

The correct development of a questionnaire requires taking into account a range of factors connected with the aim and context of research (cf. chapter Research design). The factors include:

- research subject matter, i.e: who?, what?, what phenomena?, what features? will be the research subject matter,
- a research aim, i.e. explaining why we want to research a given phenomenon, what we want to achieve on obtaining information,
- a range of research,
- population,
- a way of sampling,
- a form of measurement, i.e. in what way we will measure the level of researched phenomena,
- hypotheses, which are subject to verification.

A survey questionnaire is a research tool. As such it has its own composition. Securing the following elements in the development of a tool arises from research methodology and is connected with making use of good practices of scientific and consulting centers. A properly prepared questionnaire consists of an introduction, research subject matter, information about a research institution, clarification of the research aim for a respondent, encouragement to complete the questionnaire (refers to a survey only), instructions how to complete the questionnaire, questions, demographics (questions asked are those relating to a respondent's social and demographic circumstances and they need to be in correlation with the subject matter, research aim, theoretical assumptions and previously asked questions). Moreover, the order of questions must form a logical sequence (thematic blocks).

Difficult questions should be placed at the end or in the middle of a questionnaire and those requiring less effort at the beginning. Questions cannot be repeated (save questions which are control questions) and must follow from research problematic aspects and the principles of questionnaire construction. They should

be accessible and comprehensible for each respondent and the sense of a question must be the same for both an interviewer and interviewee. Each question in a questionnaire must refer to only one issue. Questions must be explicit and must offer a possibility to provide an exhaustive answer.

In the case of an Internet survey it is possible to construct the survey in such a way as to provide a researcher not with data pertaining to specific individuals but with the results of statistical transformation of this data (e.g. the system adds a randomly generated number to the value given by a researcher). It allows to avoid dishonest answers in the case of sensitive or personal subjects.

The selection of questions for a questionnaire should be based on particular principles such as (Malhotra, Balbaki, Bechwati 2013; Churchill, Brown, Suter 2013; Więcek-Janka 2010; Kaczmarczyk 2003):

- using a simple and understandable language,
- formulating questions in a way that does not suggest answers,
- not referring to recent events,
- not using relative terms,
- not asking (too widely) personal questions.

When formulating questions in a questionnaire, it is important to specify the level of indispensability of a question and respondents' ability to provide precise answers.

Indispensability of a question means that each question has its own precise sense. A question should not be used in a questionnaire if a researcher is not able to specify what the obtained data will be used for. Each question is supposed to provide data relating to only one, narrowly-defined issue.

Respondents' ability to provide precise answers. If the indispensability of a question is confirmed, it is necessary to define the form in which questions will be asked, that is defining the level of a respondent's ability to provide precise answers. Developing questions, a researcher should remember that a respondent:

- may not know an answer to the question,
- may nor remember specific facts,
- may provide an unclear answer,
- may provide an evasive answer.

All of these situations may lead to getting results burdened with a measurement error.

The essence of the **sequence criterion** is an appropriate development of questions in a questionnaire so they form a logical whole, bearing in mind a respondent's sociological and cultural context. The sequence of questions is of great importance as it makes it easier for a respondent to move from one question to another.

In order to keep a logical whole of a questionnaire, it is necessary to observe specific principles:

- The principles of moving gradually from general questions to detailed questions. It allows to limit situations during which detailed questions determine the range of next answers.
- The principles of the gradual exhaustion of the subject. Consecutive questions move from one issue to another until the subject is exhausted. Controversial and the most difficult questions should be placed in the final part of a questionnaire. Personal questions and personal data should be dealt with in a similar way.
- The principles of raising interest. The first questions in a questionnaire should be clear and interesting. Their main task is to inspire trust and introduce a respondent to the subject matter of research.

A **test** is a research tool by means of which a researcher learns about the properties of certain objects. Usually it consists of a rationally selected set of tasks which are to be performed by an individual or a group. Tests are a separate research method and like various types of tests, such as written and oral tests, are used to evaluate the results of experimental research or observations (Kupisiewicz, 2000, p. 35 – 41). Test research differs from other ways of control and evaluation in the fact that it is more exact, more objective and measureable. The selection and lay-out of test tasks depends on the character of research factors in a group or an individual.

Test methods make it possible to compare groups and individuals and to specify unique differences . Hence, they are relatively often used in selection processes.

From the point of view of a research object we can distinguish (Kupisiewicz 2000):

1. Ability tests
   - intelligence tests,
   - special ability tests,
2. Personality tests
   - features tests,
   - interests tests,
   - attitude tests,
   - characterological tests,
   - typology tests,
3. Information tests

From the point of view of measurement methodology we can distinguish:

1. Verbal and non-verbal tests
   - oral,
   - written,
   - drawing,
2. Action tests (manipulation, performance tests)
   - object tests (blocks, puzzles, etc.),
   - situational,
3. Projection tests

Instruction

Instruction is a separate tool facilitating the execution of research and used in various methods and research techniques, both in questionnaires, interviews, observations and experiments. It is on instruction that the high level of measurement credibility depends on. In experiments and observations instruction will present the detailed course of research and will ensure replicability (Więcek-Janka 2000). In interviews it will secure the identical course of research by various researchers. In questionnaires it will make it easier for a respondent to understand and answer a question. Examples of instructions used in questionnaires are shown in table 13.2.

Table 13. 2. Examples of instructions (own work)

Instructions	Example
Informing about the way of answering	Choose a product which you prefer. Please mark an answer which you think is right using the sign X. Please mark only one answer.
Managing the measurement process	If you have marked NO, go to question 17. If you have marked YES, please underline one possibility out of all the possibilities given below.
Explanatory	What is your family approximate income? Please combine your income with the income of a person(s) supporting the family.
Directing a respondent's attention	Before you answer the following question concerning..., please go over our explanatory letter again.

13.4. Summary

Developing each tool requires both substantive and language verification. Substantive verification consists in checking whether a researcher has taken into account all selected problems and research questions and whether the research aim can be met on using this tool. The substantive evaluation of usefulness is assisted by expert consultations. Language verification consists in conducting pilot research with a small group of respondents. During the pilot research respondents answer questions and comment on the form of asking them, the order of questions, language structure, etc. Having conducted both verifications a researcher may prepare the final version of a measurement tool and conduct the research.

Control questions

1. What are the stages in the process of constructing measurement tools?
2. Enumerate measurement tools that you know and decide in which method they can be used.
3. What principles need to be kept when constructing questionnaires?
4. What tests do you know from the point of view of a measured object?
5. What tests do you know from the point of view of measurement methodology?

14. SURVEY

14.1. Introduction

Opinion polls show that survey methods play a dominant role, drawing on IT solutions such as e-mail or Internet discussion forums. Regardless of the way in which a survey reaches a respondent, its purpose is to obtain answers to a set of questions contained in a questionnaire.

14.2. Characteristics of surveys

A survey is an indirect measuring method (does not require contact between a researcher and a respondent) whose point is to provide answers in accordance with instructions contained in a questionnaire. In a survey method the same tool can be used, which is a questionnaire. The main difference is the level of a researcher's participation in a research process (Babbie 2004; Babbie 2012; Burns, Bush 2014; Malhotra, Balbaki, Bechwati 2013).

The basic factor to be taken into account when choosing a type of survey is its aim, the characteristics of statistical population, an estimated percentage of how many filled

questionnaires are returned and how much time a researcher has to conduct the research.

Survey methods differ mainly with respect to the kind of medium by means of which a questionnaire reaches a respondent. They include (Burns, Bush 2014; Malhotra, Balbaki, Bechwati 2013; Churchil 2002):

A packaging survey, used to collect opinions and gauge the level of interest in a new product or a modernized product.

An Internet survey, used mainly in testing IT equipment, software, demo versions of various programs and polls regarding social, political and economic issues.

An auditorium survey consists in conducting research among the participants of an event (convention, conference, symposium, show, etc.). It is characterized by a high level of answers and a possibility to provide additional explanations of questions and doubts by an interviewer.

A general survey is characterized by an easy access to respondents through placing questionnaire sheets in easily available spots (fairs, railway stations, airports, health care centres, etc.). A questionnaire when filled in should be sent to an address given. Unfortunately, this type of survey is characterized by a low percentage of answers. It is often used in continuous research.

Another type of an indirect survey is a telephone interview. The point of this method is to obtain oral answers to questions asked over the phone (according to instructions).

An indirect survey is also the Delphi method, which consists in collecting information or opinions from a specific (properly selected) panel of experts. The survey is repeated, sending each time a modified version of a questionnaire, in which emphasis is placed on deepening the problematic aspects of a problem (Dalkey, Helmer 1963).

An indirect survey allows to gain a wide access to respondents, which is its main advantage. The disadvantage of this method is lack of personal communication, that is individual contact of a pollster with a respondent.

The illustration 14.1. shows the place of surveys in a matrix denoted by variables: measurement control and respondent anonymity. It can be seen that surveys ensure, in the highest possible degree, the anonymity of respondents, but do not allow measurement control. Three surveys: direct, auditorium and telephone secure both variables.

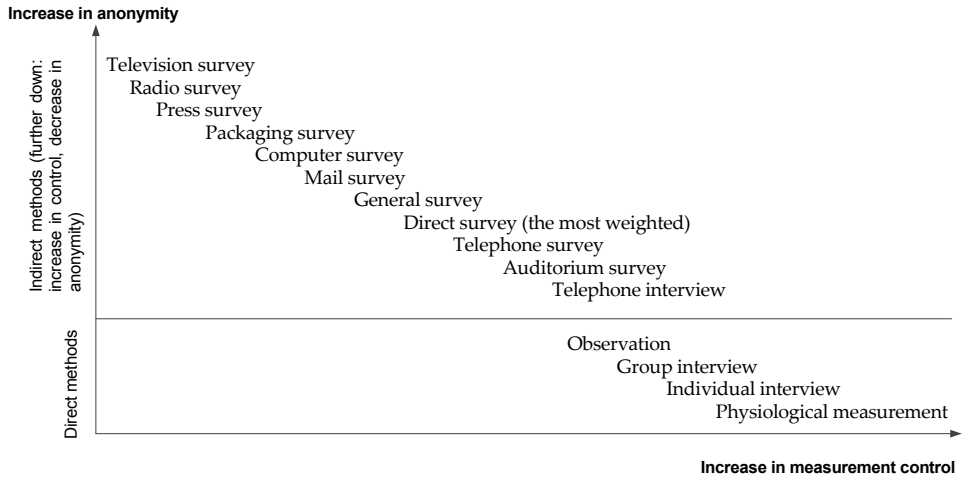


Illustration 14.1. Anonymity and measurement control (own work)

14.3. Questionnaire construction

The most popular and most frequently used instrument for collecting information is a questionnaire, which consists in the adequate formulation of questions answered by a respondent (party subject to survey) in a given sequence. It is a very flexible tool thanks to diverse forms of formulating questions. However, despite the universal character of this survey method, questions in a questionnaire should be prepared carefully in a correct form and correct sequence. The quality of these features decides how useful the survey results will be (Babbie 2004; Babbie 2012; Burns, Bush 2014; Malhotra, Balbaki, Bechwati 2013).

The form of questions may directly influence the answers provided by a respondent. Therefore, a questionnaire contains **closed questions** and **open questions**.

Closed questions are provided with all possible answers and respondents must choose one answer from a list. There is a whole range of closed questions, whose classification in contingent on how they can be used. Closed questions can be divided into:

Dichotomous questions, give two possible answers.

Example

Did you take into account information from the exhibition at Poznan International Fair when choosing our palletizer?

** YES* ** NO*

Questions featuring a **multiple choice** make it possible to choose from three or more answers.

Example

Who made a decision concerning the choice of our product?

** General manager* ** Technical manager*
** Marketing manager* ** Production manager*
** Quality control manager* **Another person*
(who?.....)

Questions containing a **Likert scale**, make it possible to determine the level of accepting a given statement.

Example

Do Polish industrial companies ensure the quality of products at the level of European companies?

**I totally disagree*	**I disagree*	**Neither agree nor disagree*	**I agree*	**I totally agree*

Semantically diversified questions, determine the scale between two extreme words. Respondents are supposed to choose a point which best reflects their viewpoint.

Example

Company "X"

Enormous ---------- *Small*
Experience ---------- *Lack of experience*
High quality ---------- *Low quality*
Modern ---------- *Obsolete*

Questions concerning **the scale of importance** order certain attributes from "not important at all" to "very important".

Example

For me after-sale service is:

** Very important*	** Important*	** Fairly important*	** Not very important*	** Not important at all*
*1*_____	*2*_____	*3*_____	*4*_____	*5*_____

Questions containing **the evaluation scale** determine certain attributes from "bad" to "excellent".

Example

After-sale service of company X is:

* Excellent	* Very good	* Good	* Satisfactory	* Bad
1_____	2_____	3_____	4_____	5_____

Questions containing **the scale of purchase intention** describe the level of purchase intention declared by a respondent.

Example

If it were possible to organize a training session concerning the introduction of innovative solutions in the company:

* I would certainly participate	* I would probably participate	* I do not know if I would participate	* I would probably not participate	* I would certainly not participate
1_____	2_____	3_____	4_____	5_____

Open questions make it possible for a respondent to provide full answers given with "their own words". Such questions may have a diverse form and usually show more information because respondents are not constrained in their opinions. Open questions can be divided into many categories:

Entirely non-profile questions are questions which can be answered freely.

Example

What is your opinion about company X's products?

Questions in which the method of **verbal associations** is used**.** It consists in presenting several words at the same time and asking a respondent to say the first word that comes uppermost.

Example

What word comes to your mind when you hear?

Metalworking _____

Polish product _____

Polish producer _____

Questions which use the method of **sentence completion.** It consists in presenting several sentences with a request to complete them.

Example

The most important element in deciding about the choice of intermediary products supplier is:

_____

Questions in which the method of **story completion** is used. The method consists in introducing respondents to the context of a problem and asking them to finish the story with their own words.

Example

"I visited Poznan Fair the other day. I had a look at some packing machines made by Polish and foreign producers. It caused me to have the following feelings". (Finish the story)

Questions in which the method of **drawing completion** is used. It is usually a questionnaire featuring a drawing with characters who are having a conversation relating to the problem referred to in the question. One of the characters has an utterance assigned in a "balloon" (e.g. here is the new boss), the remaining characters are assigned empty "balloons". The instruction accompanying the question is usually: complete the empty "balloons".

Questions using **the test of thematic perception** aim to present a drawing of a particular theme. The respondent's task is to create a story about what will happen or may happen in the drawing.

14.4. Internet surveys

The development of information technologies has made it easier for researchers to gain access to respondents on the Internet. Over the past few years the greatest popularity in surveys on large groups has been enjoyed by techniques such as: CAWI *(Computer Assisted Web Interview),* CATI *(Computer Assisted Telephone Interview)* and *CAPI (Computer Assisted Personal Interview).* In both cases we deal with a survey despite their names as there is no direct contact. The last one is of an interview character realized by a researcher by means of an internet tool (interface, sheet), which in real time totals the entered results and generates graphs and graphics. CAWI is a computer-assisted surveying technique provided with the use of a website. It is a technique of collecting information in the market quantitative research and public opinion in which an interviewee is asked to fill in a questionnaire in an electronic form. CAWI is becoming increasingly popular as it

gives a possibility to place in a questionnaire not only text-based questions but also graphic and multimedia elements (video films, sound). The low cost of survey without the need to hire interviewers is an advantage, particularly in surveys conducted over a short period of time. Researchers gain quick access to obtained data and a possibility of quick analysis because data, having been obtained, becomes directly available in an electronic form. Using this technique reduces the risk of making an error by an interviewer.

Despite many advantages, CAWI can only be used with respondents who have access to the Internet, which limits the range of the survey to a selected population. Moreover, we can never be sure who is really filling in a questionnaire.

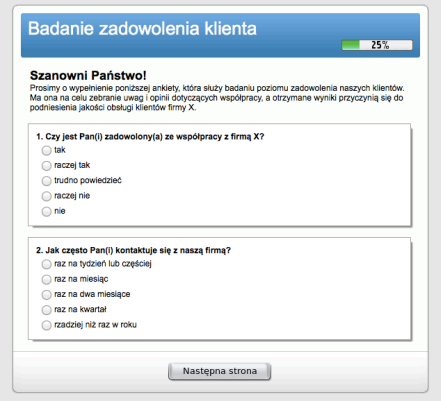
CATI is a computer-assisted telephone interview, which enables to collect information in the market quantitative research and public opinion. CATI uses an interview with a respondent carried out over the phone in which an interviewer reads the questions and notes down the answers using a special computer script. The script makes it possible to automate a questionnaire, e.g. through managing the filtering process of questions asked or randomly decide on the sequence in which specific questions (e.g. relating to product names, brands, companies, titles) will be read to a respondent. Respondents in CATI surveys are usually either chosen at random from a database (e.g. client satisfaction research) or chosen by means of a technique called Random Digit Dial (RDD).

Conducting Internet surveys has its limitations pointed out by Szpunar (2008, pp. 40-42). The researcher lists aspects which may lead to errors such as lack of answer or giving up. The said errors include:

- **Time spent on filling in a questionnaire**. The longer the questionnaire, the higher the risk it will not be fully completed. With questionnaires filled in using paper and a pencil, efficiency is higher because a survey participant becomes involved, knowing that a researcher will see that the questionnaire has not been fully completed. Thus, interviewees is less likely to give up filling in the questionnaire even if they have lost motivation to do so. In the case of an on-line questionnaire, a decision about ending the survey is just one click. A respondent cannot see a researcher so the element of involvement is not as strong as in the case of a questionnaire using paper and a pencil. Research shows that in the case of a 10-minute questionnaire 9% of people will give up, with a 20-minute questionnaire 35% will give up and with a 30-minute questionnaire 50% will give up.

- **Number of web pages.** A survey can be designed graphically in various ways. Each question may be placed on a separate web page or questions can be combined. The number of web pages influences the frequency of giving up the survey: 10 web pages - 7% will give up, 30 web pages – 30% will give up, 45 web pages – 73% will give up.
- **Clarity of instructions.** Respondents are more willing to fill in a questionnaire if it is clearly defined. The instructions should contain the aim of the survey, time needed to do the survey, information about the person conducting the survey. It is also advisable to thank for filling in the questionnaire and state whether the survey results will be presented to the survey participants or not (eg. by mail).
- **Scale.** Internet users are most likely to fill in questionnaires in which answers are based on a 5-6 point scale. Questionnaires in which it is necessary to provide written answers are more often given up.
- **Browser compatibility.** Not all Internet users use the same browsers. Designers of on-line surveys tend to forget about it and often do not optimize them to be properly viewed in less popular browsers. That results in losing a group of people who use tools other than Explorer.

It is easy to find on the Internet a lot of web pages, web portals and firms which help in designing such questionnaires. It needs to be remembered, however, that what we get is a surveying technique. The content, i.e. questions, their sequence, type of scale, is the hands of a researcher. Examples of internet surveys 14.2.



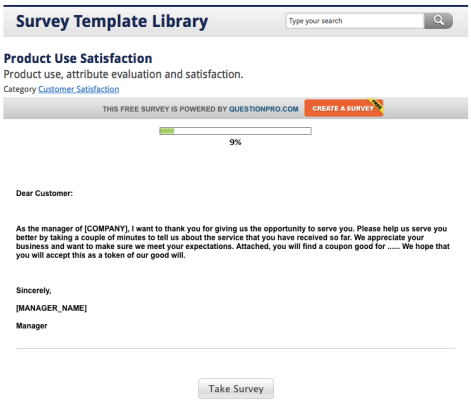


Illustration 14.2. Screenshots of web portals supporting the creation of internet questionnaires

The illustration shows a screenshot of a client satisfaction survey. The questionnaire contains a courteous form of address, information regarding the aim of survey, information how long the survey will be (expressed in percentage) and a button to be clicked in order to move to the next page. The key aspects in Internet surveys are:

- A short time to fill in a questionnaire (max 10 minutes),
- Clear instructions,
- Using a uniform scale assigned to answers (e.g. 5 points),
- A user-friendly interface (pausing the mouse over text and not only over the answer window),
- Words of acknowledgment and assurance of the validity of obtained results.

14.5. Mistakes in formulating questions in a questionnaire

The accuracy of a research instrument is closely related to the number and quality of questions asked. The number of questions should be exhaustive, neither too low (we will not get a full picture of the surveyed phenomenon) nor too high (we will cause a respondent to be weary and distracted). Formulating questions, we can often make mistakes using:

- Suggestions, by means of which researchers may force their opinions, e.g. *"Do you also think...?", "Do you drink pale or dark beer?",*
- Taractics, whose aim is to divert a respondent's attention from a researcher's true intentions, e.g. *"Was this man in the pub at night wearing a long leather coat?"* (asking such a question we can find out if a given person visited the pub one day),
- Excessive waiting. During the survey a respondent feels under pressure from a researcher. A person gives answers even if he/she does not know them (expectation of respondents giving answers incongruent with their interests),
- Too low expectations. It is a frequent mistake for beginner researchers when questions may seem infantile and not worth spending time on.
- Placing in a questionnaire double-barrelled questions which pertain to several issues at the same time, e.g. *comfort and economicality of car usage: "Do you think Volvo V70 is a comfortable and economical car?"*

- Unclear statements, colloquial language, dubious expressions or words belonging to little-known terminology is a frequent mistake in a questionnaire.
- Asking questions relating to sensitive topics which, from the point of view of research, are very important. Sometimes respondents are asked to disclose some secretive confidential information (commercial, financial, private). Asking problematic questions in a direct way may cause interviewees to feel too constrained to answer them. An example question might be: *"What is your monthly income?"*.
- Sometimes questionnaires contain closed questions which cannot be answered by a respondent as there is no appropriate answer provided. It is about cases when a question concerns, for example, favourite music genres and in the answers there are only 4 possibilities (though we know that there are many more).

14.6. Summary

Surveys, especially Internet ones, are still rarely used and not only in Polish business. Few companies are aware of how much information can be obtained from people who check their website or from clients who have e-mail accounts. A lot of companies believe that surveys are expensive, work-absorbing and difficult to analyze. Such attitude is changing, however, which can be observed in day-to-day operations of businesses. It is important then to furnish future managers with skills how to design questionnaires.

Control questions

1. What is a survey and what type of research does it represent?
2. What techniques of conducting surveys do you know?
3. Discuss surveys including variables: measurement control and respondent anonymity.
4. What kind of questions can be asked in a questionnaire?
5. What survey techniques that use a computer do you know?
6. What survey techniques that use the Internet do you know?
7. How to design an online questionnaire?
8. What mistakes are made when formulating questions for a questionnaire?

15. INTERVIEWS

15.1. Introduction

In the group of direct survey research the most widely used method is an interview, directed at solving a problem and understood as a process in which a respondent and a researcher mutually communicate with each other. An interview is a basic research method used in behavioural sciences: sociology, psychology, and marketing and management. It consists in asking interviewees more or less formalized questions. The more formalized the questions (interview standarization), the less freedom for an interviewer and the greater role played by an instrument.

The sources of information for marketing interviews are mainly:

- company employees,
- present and former employees of competitive companies,
- clients,
- suppliers, intermediaries, recipients and other entities active in a given branch of business,
- experts representing a given branch of business.

15.2. Principal classification of interviews

Due to the openness of answers, at one end of such continuum a free interview can be placed and at the other a standardized one. A simple standardized interview consists in filling in a questionnaire with rating scale answers. Thanks to that, this type of interview makes it possible to obtain uniform answers provided that questions are understandable and not complicated. A simple non-standardized interview allows a respondent to provide free answers relating to a research problem. A researcher may use auxiliary materials, i.e. charts, product samples, photographs.

15.3. Advantages and disadvantages of interviews

In marketing research, where quickness of answers is often of essence, a standardized interview seems to be very useful. A researcher has a questionnaire which contains planned questions arranged in an appropriate sequence, form and style.

Table 15.1. Advantages and disadvantages of an interview (own work)

Advantages	Disadvantages
Cognitive curiosity of a researcher, Research empathy, Interesting subject, Motivating a respondent to help a researcher, Opportunity to show one's own expression, Treating an interview as a way to single out one's own person, A researcher may use auxiliary materials, i.e. charts, product samples, photographs.	Duration of an interview, Inquisitiveness in sensitive questions, A researcher's lack of preparation for the existing situation, Non-typical research situation,

15.4. Techniques of conducting interviews

A free interview is a research method that belongs to a group of qualitative methods. It mainly contains non-categorized questions, i.e. a researcher uses directives to an interview, that is loosely formulated problems which are thoroughly discussed with a respondent. In a free interview what is important is not the sequence of asking questions but arranging a situation in a way which is similar to a natural conversation.

A free individual interview often uses techniques which break a respondent defensive mechanisms.

Example

Imagining by respondents to be somebody else facilitates the expression of opinions which encroach social norms or place respondents in a negative light.

- *Why do some mothers not want to breast-feed? (we are interested in why a given person does not do it – we use a projection effect)*
- *Why do you think some people spend a lot of time before TV?*

The most essential element in this method is increasing a respondent's level of motivation to provide honest answers.

In-depth interviews aim to perform a detailed analysis of a research problem, e.g. the course of a communication process in an organizational structure or hiding real intentions and a research problem, for example an analysis of communication flow in an organizational structure (what is essential here is to identify the scope of authority in an organizational structure). In-depth interviews are most often used when measuring the level of motivation and emotions connected with a research problem.

An in-depth group interview, also known as a focus group interview, is another technique of conducting interviews. The fundamental attribute of a group interview method is group dynamics, understood as interaction between members of a given group and a moderator conducting an interview. A group in this case should be understood as a collection of units remaining in mutual relations, which are essential from the point of view of a research aim.

The advantage of group interviews is the possibility to use a lot of properties of social groups and relations between these groups' members. The list includes:

- synergy effect – a common group effort allows to generate a wider range of ideas;
- snowball effect – commentaries provided by some group members cause others to reply; it allows to effect a higher level of involving other discussion participants;
- stimulation effect - a group generates a higher level of motivation and enthusiasm to perform a given task;
- security effect – group participants have a higher level of security; it allows to disclose real motives and opinions;
- spontaneity effect – answers provided are more natural and spontaneous.

15.5. Classification of group and in-depth interviews

Meeting research aims by means of in-depth group interviews requires a precise expression of interview criteria, planning and developing a script of such an interview. The classification criteria of in-depth group interviews are presented in illustration 15.1.

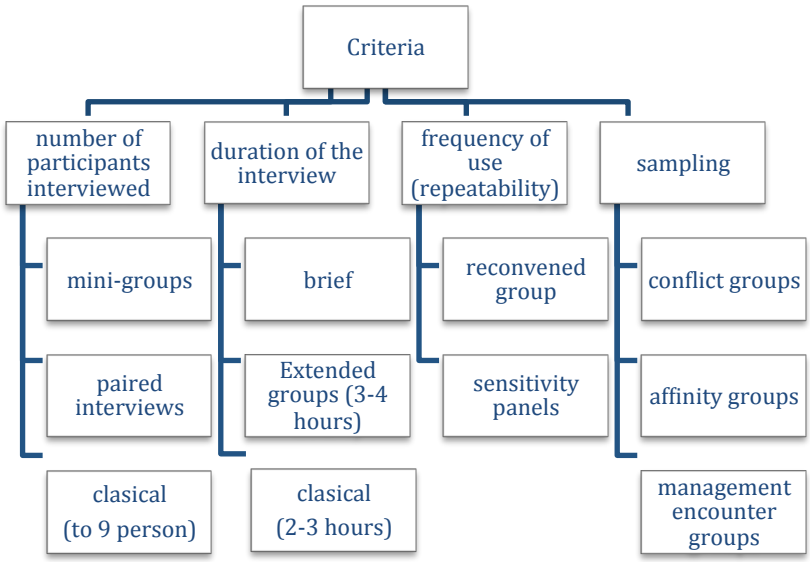


Illustration 15.1. classification of in-depth group interviews (own work)

The first classification criterion pertains to the number of research participants.
Such a criterion allows to single out:

- Mini-groups - it is a kind of in-depth interview which includes 4-6 respondents. The respondents are often people belonging to the so-called difficult groups (people remaining in a conflict, suspects, etc.);
- Paired interviews are used when respondents are equal partners in a given decision-making process and when they represent contrastive viewpoints. This method is colloquially called a debate. The main aim of such an interview is to emphasise a path that leads to reaching a consensus or an emerging conflict, its potential directions of escalation and the establishment

of the degree of influence that each of the parties has on attaining a compromise.
- Classical interviews with 8-9 respondents are the most often used forms of group interviews.

Another criterion featured in illustration 15.1 is the criterion of interview duration. Developing an interview script is closely related to the duration of the whole research. Hence, a researcher's needs must be recognized and the most useful form must be chosen. We can differentiate between:

- Briefs, during which participants, appropriately guided by a moderator, are supposed to concentrate on the most essential question for research problematic aspects. Such interviews are often conducted in frameworks;
- Extended groups are characterized, apart from the length of duration, by the application of supporting techniques. An interview with a group lasts about 3-4 hours. A considerable part of the interview is devoted to the introduction of techniques involving respondents in a creative execution of tasks. These are mainly projection techniques such as psychodrama or collage as well as techniques for generating new ideas, e.g. brainstorming;
- Classical interviews - these most common group interviews usually last from 1.5 to 2 hours and concern specialist problematic aspects – which are well known by research participants.

The frequency of repeating interviews is another division criterion. Thanks to such encapsulation we distinguish between:

- Reconvened group – this technique allows the emergence of different levels of variability in opinions voiced and attituded adopted. It is carried out twice with the same group of respondents.
- Sensitivity panels are multiple meetings with the same respondents. Numerous supporting techniques are used here. Data collected through sensitivity panels is fuller, deeper and participants show their true emotions and greater creativity.

A research aim and a proper choice of sampling method constitute another criterion of classifying in-depth group interviews:

- Conflict groups. This form of interview includes respondents who potentially represent adversarial attitudes.
- Affinity groups. These are interviews which include family members, neighbouring groups or other strongly consolidated groups.
- Management encounter groups. They included participants representing two conflicting sides of a problem (market competitors, buyers and sellers of given products).

Knowing the classification criteria of in-depth group interviews one can clearly specify preliminary assumptions for the construction of scripts and organization of meetings.

Example

An interview with a company co-owners who remain in a conflict. Aim: identifying adversaries' viewpoints.

- *organizing FGI with a pair of participants*
- *in an extended interview (3-4h), repeated*
- *every 2 months (sensitivity panel)*
- *during an existing conflict*.

Example

An interview with a group of employees analysing thier social needs.

- *classical organization of FGI 8-9 participants*
- *classical interview 2-3 h,*
- *an interview will be repeated after 6 months,*
- *affinity group – individuals working at similar positions in one company.*
-

A group interview requires a proper organization and should be conducted according to a specific plan which covers a few stages: preparing a place; recruiting participants; choosing a moderator; developing instructions; preparing a final report.

15.6. A script of an in-depth group interview

The basis of a properly conducted group interview is the development of a script containing a sequence of activities which need to be performed during a meeting with respondents and an exact time allocation. Each activity should be clearly described so that moderators (if there are more than one and research covers a wider area range) do not differ in their respective behavioural patterns.

Example[4]

Researching students and university graduates. Aim: evaluation of needs of universities, students and graduates in the area of building durable relations which will serve to acquire and exchange mutual knowledge about the currect situation on the job market and of both parties' needs resulting from the necessity to adapt to ever-changing social and economic conditions.

INTRODUCTION [10 minutes]

- *Introduction of a moderator – explaining his/her role;*
  Introduction of the meeting and research aims: explaining the idea of research and the role of a group interview, why we have met here and what will we do?
- *The moderator presents the research aim: The research aim is to perform the evaluation of the needs of universities, students and graduates which relate to building durable relations which will serve in acquiring and exchanging mutual knowledge about the current situation on the job market and of the needs of both sides resulting from the necessity to adapt to ever-changing social and economic conditions.*
- *Establishing discussion principles – explaining the discussion rules including information about recording, the question of using data; group participants represent only themselves in their opinions – they express themselves from the position of "I" and not "we" or in an impersonal mode.*

WARM-UP [15 minutes]:

Introductory questions. Questions related to the subject, concerning general experiences. They should not be of critical meaning for the subject (they should not be too serious, deep, threatening)

PROPER DISCUSSION [60 minutes]

Essential questions in all areas:

- *diagnosis of the relation graduate – university;*
- *evaluation of expectations and needs of students and graduates in the range of building mutual relations with a university in the further process of education and*

[4]On the basis of a report: Diagnosis of the needs of universities, students and graduates in the range of building durable relations university – student – graduate based on the mutual exchange of knowledge and experience,
http://www.ideagora.mazovia.edu.pl/sites/ideagora/files/pages/672/raport_z_badan_poglebionych

functioning on the changing job market and access to knowledge possessed by a university;

- *evaluation of university and graduates' readiness to build a durable relation whose effect will be a mutual transfer of knowledge in the range of science and practice;*
- *evaluation of possible developmental perspectives of a univeristy and its graduates as a result of a new approach to the relation graduate - university;*
- *studying in the future – a gradute of the future;*

1. Research area 1: Diagnosis of the relation graduate - university [10-12 minutes]

- *How do universities currently perceive their graduates? How do graduates perceive their university?*
- *What activities which could contribute to shaping long-term relations with graduates are carried out by universities?*
- *What activities in the range of building relations with a student, future graduate are carried out by universities? Are they sufficient enough to build a long-term relations ?If not, what kind of activities should they be?*
- *What can a university offer graduates?*
- *What sources of knowledge about job market needs does a university use? Do universities cooperate with business in this respect? What kind of relations are they?*
- *Other essential questions.*

2. Research area no. 2 – evaluation of expectations and needs of students and graduates in the range of building relations with a university in a further education process and functioning on the changing job market and access to knowledge possessed by a university [10-12 minutes]

- *What classes are missing at university that would facilitate for students and graduates to move around the volatile job market?*
- *How to shape an attitude of a person-employee who is flexible, entrepreneurial, prepared for changeable social and economic conditions? What can a university offer in this respect?*
- *Do universities teach students innovativeness, openness, resourcefulness, team work, creativity?*
- *What kind of support do graduates expect from a university?*
- *To what extent is it possible for a gradute to use knowledge possessed by a university (in particular having access to scientific research results, library resources, etc.)?*
- *Other essential questions*

3. Research area no. 3 – Evaluation of the readiness of universities and graduates for building durable relations whose effect will be a mutual trasfer of knowledge in the range of science and practice [10-12 minutes]

- *To what extent are universities ready to tie their educational offer with the needs of social and economic environment (dynamically changing situation on the job market)? Are they flexible and open enough? What are they missing to effectively combine education with practice?*
- *To what extent are universities ready to treat graduates as subjects in an educational process?*

4. Research area no. 4 – Evaluation of possible perspectives of development of a univeristy and its students as a result of a new approach to the relation graduate – university [10-12 minutes]

- *Is it possible in the existing model of the higher education organization to change the relation student – graduate – university? What steps whould have to be taken?*
- *How could information about graduates' professional life be used by a university to shape its own educational offer?*
- *What do employers expect from a graduate and university?*
- *What graduates are sought after by employers? Is a university able to respond to these needs?*

5. Research area no. 5 – Studding in the future – a graduate of the future [10-12 minutes]

- *What form of functioning should a university adopt? (What should it teach?)*
- *Are universities supposed to be a breeding ground for theoretical intellectuals and practical specialists?*
- *Do universities teach students adaptation skills? What attitudes should be taught?*

SUMMARY [15-20 minutes]:

Summarizing questions, questions about the future.

What changes in the current system of teaching students and relations with graduates could contribute to changing an unfavorable current opinion about teaching students which is deemed inadequate in relation to the current job market needs?

15.7. Delphi interview

Consulting and coaching make use of expert knowledge to solve company problems and problems concerning employees. The most "expert" method, that is the one which requires the highest level of experts' involvement and which is also the most widespread, is the Delphi method. Its name directly refers to the ancient greek town of Delphi, where Pythia served as an oracle in the temple of Apollo. The forerunners of the Delphi method are Helmer and Dalkey (1963), who

described this method in the 1950s of the 20th century for the evaluation of the USA military situation. The method was widely used for the first time while conducting prognostic research.

The Delphi interview belongs to the group of heuristic methods in which the process of making decisions requires the application of experts' knowledge, experience and opinions. This type of interview is used to determine chances or time of future events. The suggested prognosis is obtained through conducting a series of personal interviews or through communicators (also by means of a survey) among experts. Research carried out by means of this method may supply both qualitative and quantitative data with prognosis elements.

The Delphi interview consists of a few stages at which the results of previous research are the source and basis for the next approach. For this reason, experts' answers provided at the second and consecutive stages are influenced by previous experts' opinions. This is an essential element which differentiates this method from other types of research.

The Delphi method has a lot of advantages which include: independence of opinions, anonymity of opinions, avoiding dominant personalities, controlled feedback, remote group communication, possibility to analyze research results statistically. However, this method has also threats. Research conducted by means of this method is often expensive. Carried out during conventions or conferences, it is characterized by the dominance of one or more individuals, lack of responsibility borne by participants, reluctance to publically change an approach adopted earlier and overburden with superfluous or irrelevant information. It seems, however, that the benefits of this method outweigh the costs.

Designing the Delphi interview has its own specific character and is connected with a long time of conducting research. The very research process has several research cycles. The main stages of one research cycle of the Delphi interview include:

1. Defining a problem,
2. Choosing a group of experts,
3. Preparing questions,
4. Meeting with an expert and/or sending a survey,
5. Analyzing returned answers,
6. Has the consensus been reached:
   - Yes, move to point 10,
   - No, move to point 7,

7. Preparing another list of questions,
8. Another contact with experts,
9. Another analysis of answers, return to point 5,
10. Presenting results.

15.8. Summary

Conducting interviews, regardless of a technique adopted, is considered the most solid but also the most expensive survey method. The choice of a proper technique out of those presented above depends on a research aim and researchers themselves.

Control questions

1. Define an interview.
2. What types (groups) of interviews do you know?
3. What does the process of standardizing interviews consist in?
4. Discuss the advantages and disadvantages of using interviews.
5. Characterize in-depth group interviews.
6. List the criteria and types of in-depth interviews.
7. What elements does a script of an in-depth group interview consist of?
8. What is the Delphi interview and in what ways does it differ from a traditional interview?
9. What stages does the procedure of the Delphi interview cover?
10. What are the advantages and disadvantages of the Deplhi interview?

16. OBSERVATION

16.1. Introduction

An observational method is a way of conducting research in which observation plays an essential role and whose application does not entail changes in the local environment. It is an intentional search for facts, an intentional activity of learning about things through senses. A scientific observation, being a part of an observational method, is the process of careful and intentional perception. The cognitive value of an observational method consists in the description of phenomena, which are often the beginning of scientific research. It is the oldest working method of scientific work and its elements are present in many other methods.

16.2. Classification of observations

Observational methods can be classified as observations without and with intervention.

Observation without intervention – its purpose is to provide a natural description of emerging behavioural patterns without the intervention of a researcher. This

method is characterized by a high level of accuracy. When such observation takes place in natural conditions, it is called naturalistic observation (Babbie 2004; Babbie 2012; Burns, Bush 2014; Malhotra, Balbaki, Bechwati 2013, Shaughnessy, Zechmeister, Zechmeister 2002).

Observation with intervention – comprises situations when researchers interfere in a spontaneous course of events. There are three types of such a form of observation:

- participant observation – a researcher participates in the situation which is the subject of observation;
- structured observation – may be carried out in natural or artificial conditions; a researcher brings up events that he/she takes interest in.

16.3. Overt and covert observation

Another classification element is the overtness of observation. During overt observation people being investigated know that they are the subject of interest for an observer. However, they do not need to be advised about the subject and aim of research. For this reason they can change their behaviour.

During covert (hidden) observation people being investigated do not know that they are the object of observation. Thanks to that, their behaviour is treated as more "natural". Some sort of difficulty , when using this technique, is the necessity to register the results in a way which is imperceptible and which does not arouse suspicion.

16.4. Participant and non-participant observation

A researcher's participation in observation is another variable which allows to classify this type of research. Participant observation consists in entering by a researcher a given social environment and observing a given community from inside. A researcher, as a community member, participates in everyday life. The advantage of such a method is the adoption of a viewpoint of a given community, finding out about the life and culture of its members. A researcher may take notes immediately or record his/her observations (photography, film, audio recording). The disadvantage is the fact that a researcher must adopt the viewpoint of a

researched object renouncing at the same time his/her own viewpoint, stereotypes or beliefs regarding researched objects, which is not easy.
Non-participant observation consists in observing a given community from outside, that is without interfering in community members' interactions and behaviour, e.g. by means of a video camera.

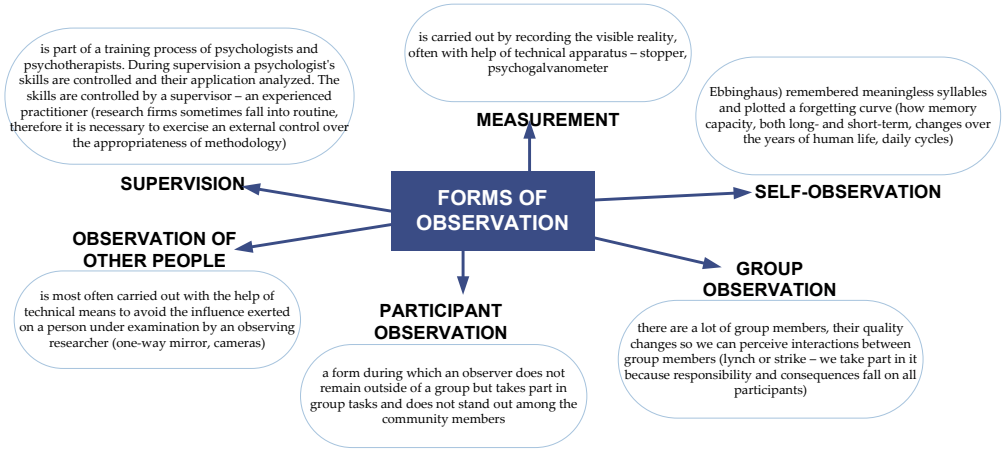


Illustration 16.1. Forms of observation (own work)

16.5. Controlled and uncontrolled observation

During controlled observation, what and how something is registered is clearly defined. The registration of observation results is most often based on observation sheets. It is a standardized technique whose results may be anlayzed by means of statistical methods.
Uncontrolled observation is a flexible technique in which the aim and scope of observation as well as the way of measurement registration are not clearly defined and depend on a researcher's discretion.

16.6. Special kinds of observation

Self-observation is a form of observation carried out by a researcher himself/herself. This form of observation requires a researcher to be patient in

conducting research, which often takes many years (cf. Ebbinghaus, Flaming), and approach observation results in an objective way.

Example

Self-observation of physiological changes during the introduction of regularly repeated physical exercise.
Research aim: observation of the influence of regularly taken physical exercise on the physiological reactions of organism (pressure, pulse), bearing in mind external factors.
Process: Research consists in carrying out physiological measurements by means of a sphygmomanometer. Measurements should be made systematically every day prior to beginning physical exercise, which should include three rounds. The research was also affected by weather factors, mood, length of sleep.
Hypothses:

- *Regularly taken physical exercise regularly reduces blood pressure hikes.*
- *Bad weather conditions have an unfavourable effect on the physiological aspects of organism.*

Assumptions:

- *Exercise and the measurement of external factors take place every day at the same time (+/- 1 hour)*
- *Measurements relate to one kind of exercise*
- *Exercise is not a sport which is regularly practised by a person under examination*
- *30 minutes before taking the first measurement a person under examination must not consume any substances (coffee, strong tea, cigarettes, etc.) or medicines which may increase the value of blood pressure*
- *Each measurement is made on the wrist of the right hand*

Supervision is a form of observation consisting in the evaluation of work by an expert. Such observation is also called audit or inspection.
Shadowing – a type of observation consisting in following in a continuous way a given person or group of people. It may consist in, for example, accompanying a representative of a given profession in his/her work or observing behaviour connected with buying. This method is particularly useful for pointing out behaviour and phenomena of whose existence or scale a person under examination is not aware.
In a technique called Mystery Shopping, the task most often consists in going shopping and describing experiences connected with this act in previously

prepared answer sheets. In particular, the elements subject to evaluation include: the image of retail outlets, product presentation, customer service and mechanisms used to build customer loyalty. A company under examination receives a report with results expressed as points and a description of the existing situation.

Example

A Mystery Shopping observation sheet in a selected service company for the evaluation of pre-transaction activities of the buying process

Observation sheet

PRE-TRANSACTION STAGE	**Yes/no**	**Remarks**	**Evaluation 1-5**
	Date:		*Time:*
Is it easy to find the company website?			
Is the website clear (is it easy to navigate, does it contain ads of other companies, are the colours of the website and font size appropriate, etc.)?			
Does the website contain comprehensive information about services offered by the company (description, price, order lead time, etc.)?			
Does the website contain company contact details (phone, e-mail, address, business hours)?			
Did it take a short time to receive a reply to a question asked by e-mail?			
Was the return e-mail written in a kind and friendly style?			
Did the return e-mail contain personal forms of address directed at the recipient?			
Did the return e-mail express an employee's willingness to provide help?			
Did it take a short time to get through to the outlet staff by phone?			
Did the employee introduce himself/herself and the company for which he/she works during the telephone call?			
Was the employee kind, nice and cultured during the call?			
Did the employee actively listen to the customer?			

Was the employee engaged during the conversation with the customer?			
Did the employee display a high level of knowledge related to products/services?			
Did the employee provide clear explanation related to products/services?			
Is it easy to access the company?			
Was there a parking site near the outlet?			
Was there clear information on the door about days and business hours?			
Was the floor clean and tidy (i.e. was there no litter, dust, damp patches, stains, dirt)			
Were conditions inside the outlet comfortable (i.e. was it not too sultry, hot, cold, was the smell pleasant)			
Were the counters clean and tidy (i.e. were they not dirty, covered with dust, etc.)			
Was the computer equipment and devices clean and tidy (i.e. were they not dirty, covered with dust or stains, etc.)			
Was the range of services complete?			
Did the company have a current price list of services?			
Did the employee welcome the customer of his own initiative?			
Did he/she welcome the customer with a smile?			
Was he/she standing when the customer was welcomed?			
Were the staff members appropriately dressed?			
Did each employee have a name badge?			
Was the waiting time for being serviced short?			
Was the employee willing to help?			
…			
General impression			

16.7. Observation as a scientific method

Using observation as a scientific method must be preceded by a careful analysis and organization. In particular, the following elements should be taken into account:

- Observation frameworks:
- determine the subject of observation, e.g. ways of behaving in a given situation,
- choose a field, e.g. limit a place,
- choose a medium,
- scope of observation – stretches from incidental to systematized observations, e.g. analysis of the ways of work, registration of shoulder movement,
- sequence of observation,
- detailed record of information obtained – it is made in accordance with the previously established principles so that it can be used at a later time.
- Reduce the influence of subjectivism:
  - horizon – it is a certain lack, e.g. of attention, knowledge. Considered depending on data obtained,
  - lack of reality – performing selections with respect to values confessed,
  - emotional tinge – deformation influenced by affect,
  - choice of perspective – omitting certain features or their excessive number,
  - bias – when a researcher yields to influences before the beginning of research.
- The halo effect – some previously spotted features, e.g. the first impression eclipses current assessment, but also: easy and quick acceptance of imprecise observation, interpreting results in accordance with expectations, tendency towards average results,
- Tiredness, which, when involved in a long process of observation, may affect the obtained information.
- Excessive hurriedness which may lead to drawing hasty conclusions.

16.8. Summary

Observation is the oldest and most natural form of research which is used by each researcher in the process of preliminary research, specifying the scope and subjects of scientific interest.

Control questions

1. What is observation?
2. What forms of observation do you know?
3. What are observational frameworks?
4. In what way does subjectivism affect an observation result?
5. What is the halo effect?

17. EXPERIMENTS

17.1. Introduction

Obtaining data and information in marketing most often takes place through the application of tools and techniques of opinion survey. The situation looks different in the case of experiments. Drawing upon the methodology of experiments, a researcher obtains information about dependencies between research variables and a research object (Shaughnessy, Zechmeister, Zechmeister 2002).

17.2. The essence of experiments

Experiments are a form of a research test which consists in establishing the influence of an independent variable on a dependent variable. In marketing research, dependent variables usually cover sales volume, customer satisfaction, brand awareness, etc. Independent variables include products, price, promotional activities, organization of distribution. Experimental research is most often conducted in two groups allowing to compare the results and the evaluation of the influence of dependent variables on independent variables, and they include a control group and an experimental group which is subject to a given factor and is

compared with a control group which is not subject to a given factor. Situations before and after an experiment are also compared.

17.3. Experimental techniques

The principal experimental techniques include a technique with one variable in which a detailed division into research with a control group and research without a control group is made. Another technique is a study with many variables, where a simple random experiment is one of its forms. The selection of random groups and control groups is of paramount importance because it is subject to many variables (Malhotra, Balbaki, Bechwati 2013, Shaughnessy, Zechmeister, Zechmeister 2002). One of the varieties is a stratified random experiment, which is used when a group is very diverse. Then, selection is performed according to criteria (e.g. age, sex, profession). Thanks to that, it is possible to select more uniform strata and a measurement is made before and after entering data.

Experimental research can also be split into:

- Quasi experiments – these are experiments which do not offer a chance to specify objectively the influence of a given variable on a given phenomenon. There are a lot of side factors here, which may cause changes.
- Real experiments – offer a great chance to eliminate incidental factors. Such possibilities arise as a result of making a lot of measurements before and after introducing a variable.
- Experiments with a series of measurements differ from the previous ones with the number of measurements. It allows to eliminate side factors and draw conclusions without errors.
- Experiments according to conditions under which they are conducted:
    - Laboratory experiment – artificially created conditions allow to exercise the best control over the influence of an independent variable on a dependent variable. The disadvantage is the fact that research is not objective and the conditions created often do not reflect real market conditions. We divide them into:
        - tests in exhibition halls – refer to consumption products.
        - clinical tests – refer to investment products. This test must be carried out by a specialist.

  - auditorium test - is used to assess the effectiveness of advertising.
  - test of the efficiency of visual advertising – it measures the level of the efficiency of visual advertising (quick presentation, e.g. slides). A respondent records what he/she saw and managed to remember. We know how fast certain images are recognized and remembered.
- Market experiment – natural, conducted under real market conditions. Its advantages are all disadvantages of a laboratory experiment. Its variant is a standard experiment in which research is conducted bearing in mind the influence of a geographical and cultural context and the following elements: territorial representativeness, rationality (indispensable number of a sample, research cost) and respecting the specific character of demographic and competitive context of a given local market. The main disadvantage of this experiment is its obviousness to competitors.

17.4. Conditions of experiment implementation

In order to carry out research by means of an experiment method, three fundamental conditions must be fulfilled:

1. Both an independent variable and a dependent variable must appear in a proper sequence – there must be an event, which is the cause of the following effect.
2. The observed effects of the changes of variable values take place at the same or similar time – the influence of an independent variable (cause) on the effect must be examined in the shortest possible time since its inception. The effect analyzed after a long time may pertain to a different cause than the one we are considering.
3. Factors which become eliminated are the ones which can have an influence on the change of the value of a dependent variable and which cannot be attributed to manipulating the level of an independent variable – it means that a researcher must eliminate all disruptions and factors which are not subject to research and which may affect its result. This measure aims to eliminate an element of uncertainty in the interpretation of results.
4. It is important to take heed of the necessity to plan an experiment variation, i.e. a future possibility to repeat the experiment with changes.

5. A well-planned experiment is conditioned by its replicability. An experiment must be planned in a way that allows interested parties to conduct it retaining the same research conditions.

17.5. Stages of experiment implementation as a scientific method

Securing experiment replicability requires the use of a detailed research procedure, which will ensure transparency, practical applications, and a general character of results. The main elements in the course of an experiment are (Shaughnessy, Zechmeister, Zechmeister 2002):

- Determining a research problem
- Developing hypotheses
- Drawing up a plan of an experiment
- Defining control parameters
- Defining research parameters
- Developing techniques and tools for data registration
- Making a measurement (collecting data)
- Analysis and interpretation
- Discussion
- Analysis of errors and uncertainty
- Conclusions and recommendations

17.6. Errors in carrying out experiments

In experiments, due to their complexity, implementation conditions and researchers' expectations, it is easy to make a lot of errors. The most frequent errors include:

- Error of meaning - it is characterized by difficulty in operationalizing a problem. At the stage of research design it happens that a researcher does not perceive the gist of a real problem, which leads to a superficial treatment of a problem.

- Error in planning an experiment – it is connected with an inappropriate formulation of a research problem or research hypotheses and also with a wrong development of experiment conditions.
- Error of instructions – it refers to the reliability of a measurement and securing the replicability of research methodology.
- Error connected with isolation - in laboratory experiments research objects are often fully isolated from natural factors of the environment, which may affect research results. That might cause research results to be entirely different under natural conditions.
- Excessive generalization of results – an experiment, due to its specific character, allows for a relatively small sample. If a sample has been badly selected, there might be a problem with generalizing results to the entire population.
- Ethical borders – an experiment is a test in which a researcher controls both research variables and research situation and a person under examination is entirely deprived of anonymity. A research aim should provide for the interests of people investigated, particularly children, and prevent them from having traumatic experiences.

17.7. Popular sociological experiments

Asch conformity experiment

Directed in 1955 by Salomon Asch, this experiment concerned the analysis of the influence of a group on an individual specifying, in particular, normative conformity.

He presented lines A, B, C, X to volunteers. He then asked them to decide which line A, B, or C is the most similar to line segment X. In reality line segments C and X were of equal length, and the participants had no doubts about it if they were sitting in front of a screen on their own. Under such conditions 98% of the participants answered correctly. However, the situation changed once the test had been carried out in a group. Asch introduced into the experiment his seven collaborators, who were considered volunteers by other participants. In the first two attempts the actors were supposed to provide correct answers, whereas in the third attempt they were supposed to say that X was most like A. The results of this experiment were surprising: about 66% of the participants changed their opinion and opted for the opinion that line segment X was most like line A. Asch analyzed the reaction of people in a group. He observed the so-called normative conformity

– a sign of submission to the majority dictated by fear of being discarded by a group and a desire to be accepted by group members.
The respondents changed their opinion despite being told to receive money for a correct answer. They did not know the other participants. The line segments were clearly unequal. It was unlikely for the participants to meet each other again[5].

Stanford prison experiment

The subject and aim of research carried out in 1971 at Stanford University was to test the psychological effects of simulating prison life. The experiment was conducted by a group of SU psychologists under the authority of Philip Zimbardo. In the basement of the faculty of psychology at Stanford University, rooms that were supposed to like prison cells had been prepared. Inside them there were 18 young people, 9 acting as prison guards and 9 as prisoners. The participants' behaviour or, to be more precise, its changes taking place during the implemention of a thought-up penalty, is considered to be dependent variables. Originally, the experiment was to last two weeks. However, it came to an end after 6 days because personality changes in the participants playing the role of prisoners were worrying[6]. The prisoners, on being arrested, were dressed in long white shirts with an identification number on both sides. A heavy chain fastened with a padlock was attached to the right foot. A woman's stocking had to be worn on their heads.
The prisoners had to address the guards with the words “Mr Correction Officer” and each other using identification numbers only. To remember them well, the guards organized “countdowns” several times during each shift. With each consecutive day of the experiment the guards' level of aggression rose and the prisoners' morale decreased. On the sixth day both groups fully yielded to the roles they had been assigned.

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[5]See: https://www.youtube.com/watch?v=NyDDyT1lDhA

[2]See: https://www.youtube.com/watch?v=760lwYmpXbc

[3]See: https://www.youtube.com/watch?v=BcvSNg0HZwk
https://www.youtube.com/watch?v=IzTuz0mNlwU
https://www.youtube.com/watch?v=CmFCoo-cU3Y

Milgram experiment

The experiment was conducted in its original form in the years 1961-1962 by a social psychologist Stanley Milgram. Milgram asked himself a research question: "Is it enough to receive an order to fatally electrocute a stranger?" The aim of the experiment was to measure the level of people's obedience towards authorities. Volunteers started coming to the laboratory after reading an announcement in a newspaper. They were sure that they would be taking part in research of "the influence of penalties on memory" for which they would be paid. They were told that they would receive money just for coming to the laboratory and they would be able to keep it regardless of what would happen. When a person was entering the laboratory, there was already another person. In fact it was the experimenter's assistant. The research singled out two roles: a teacher and a pupil. A teacher found out that his/her task would be to read a pupil a list of pairs and then to check how many of these pairs the pupil remembered. If a pupil answered well, a teacher read another word. If a pupil's answer was wrong, a teacher imposed a penalty in the form of electric shock. The rule was that after consecutive mistakes the power of electric shock was increased to the maximum level of 450 Volt. In such an experiment the highest shock was dealt to a pupil by 65% of the participants[7].

Experiments can be conducted in each sphere of activity, not only scientific or marketing. Example shows that experiments can be used in sports and educational activity as well as in a family context.

Example

Problem: Anna plays handball. She is reputed to be a great striker. She is not very skilled at penalty shots though. Chief goalkeeper Daria often saves Anna's shots. Anna scores 4 shots out of ten, while the remaining handballers score 6.

What is the cause of Anna's low level of efficiency?

Hypotheses:

- *Goalkeeper Daria can intuitively save Anna's shots.*
- *When performing penalty shots, Anna adopts a wrong posture (according to her coach she leans to the right too much)*

Designing an experiment to verify hypothesis 1

Performing a series of penalty shots saved by various goalkeepers: A – Kasia, B – Daria, C – Iwona.

Anna should perform a few series of penalty shots, e.g. 5 in the goalkeepers' sequence A, B,C, B, C, A, C, B, A

Designing an experiment to verify hypothesis 2

The coach is going to work with Anna to change her posture before shooting so that shots are not automatically made out by a goalkeeper. After the correct posture has been mastered, a verifying test should be carried out.

Anna performs a few series of shots at the goal kept by Daria, e.g. 5 shots with a wrong posture (control series) and 5 with a corrected posture (test series).

Such a test should be repeated several times. The results should be noted for each series and ultimately compared.

Conditions required to conduct the experiment:

- *It is necessary to ensure that Anna's form is at the same level during the penalty shootout (allowing breaks and ensuring an adequate level of organism hydration).*
- *The verification of hypothesis 1 can be performed conversely.*
- *The verification of hypothesis 2 can be performed after an appropriate body posture during a penalty shootout has been developed.*

Data:

Experiment 1			*Eksperyment 2*	
Goalkeeper	*Shots*	*Shots scored*	*Shots*	*Shots scored*
A	*5*	*3*	*5 former posture*	*3*
B	*5*	*3*	*5 new posture*	*4*
C	*5*	*3*	*5 former posture*	*4*
B	*5*	*3*	*5 new posture*	*4*
C	*5*	*4*	*5 former posture*	*3*
A	*5*	*2*	*5 new posture*	*5*
C	*5*	*3*	*5 former posture*	*3*
B	*5*	*5*	*5 new posture*	*4*
A	*5*	*4*		

Analysis and interpretation:

In experiment 1

The average of shots scored into the goal kept by:

A (Kasia) = 3; B (Daria) = 3.3; C (Iwona) = 3.3.

In experiment 2

The average of shots scored when maintaining a former posture was 3.3.

The average of shots scored when adopting a new posture was 4.3.

Analysis of experiment errors and uncertainty:

- *One needs to think if the number of penalty shots was sufficient*
- *Is it then necessary to repeat the whole process with a higher number of penalty shots?*

Conclusions and recommendations:

The conducted experiment showed that hypothesis 1 is not true. Anna's accuracy problem has nothing to do with the goalkeepers' intuitions.

The experiment let hypothesis 2 to be confirmed. The change of a body posture during the penalty shootout allowed Anna to improve her accuracy.

17.8. Summary

An experiment, as one of the methods of research implementation, makes it possible to detect cause and effect dependencies of research objects or phenomena. This method is best suited for conducting research on phenomena which repeat themselves under conditions which are at least partly identical. Therefore, the method can be used to carry out research on social phenomena - economic or political.

Control questions

1. Discuss the essence of an experiment.
2. What experimental techniques do you know?
3. What stages should an experiment consist of?
4. What does the replicability of an experiment consist in?
5. What are control parameters (groups) and what are they used for?
6. What did the Asch conformity experiment consist in?
7. What did the Stanford prison experiment consist in?
8. What did the Milgram experiment consist in?

18. MEASUREMENT AND MEASUREMENT SCALES

18.1. Introduction

Each day, each human deals with measuring various phenomena, properties or objects. These acts are connected with the necessity to make decisions, starting with the simplest – what to eat?, what to wear? - and ending with the complex ones, e.g. how to manage people to increase their motivation for work?, etc. In general, measuring all these things is supposed to help us make an optimum decision. A temperature measurement will allow to choose appropriate clothes, measuring employee job satisfaction will point out to a manager gaps and shortcomings in running a team.

18.2. The notion of measurement

What is a measurement? A measurement can be understood as the process of assigning numbers to research objects according to previously developed principles whose correctness can be verified empirically. It means that with the

help of a measurement it is possible to determine the intensification level of certain characteristics or properties of research objects. In social and management sciences, a problem is identified specifying principles which would assign numbers to measured characteristics of qualitative research phenomena. An attempt was made to make use of principles implemented during physiological study (Tull, Hawkins 2013; Mazzocchi 2008; Mynarski 2000; Kujawińska, Więcek-Janka 2011; Chakrapani 2009; Adamkiewicz-Drwiłło 2008). It turned out to be difficult to be implemented due to the fuzzy borders of investigated features by various researchers (example).

Example

Wishing to obtain information about the height of a group of 50 junior high school students, two methods were applied: the first one used a height measurement expressed in cms (in addition it was divided into four groups: S, M, T, VT); the second one consisted in the evaluation provided by three experts (of the same age), whose task was to determine "at a guess" the height of a given person and assign him/her to an appropriate group (the experts had no information whatsoever about the height expressed in cms): S-short; M-medium; T-tall; VT- very tall. The results of this experiment showed a high level of convergence between the experts' assessment and a physical measurement. The first method seems to be more precise and simpler in the evaluation, yet it is not always the case that a proper tool, which allows to perform an exact measurement, is available

Complying with and accepting qualitative features as valuable, as regards research, allowed to apply diversified measurement levels in the form of measurement scales. It was ascertained that numbers could be assigned to measured features on the basis of various properties of a specific set of numbers: beginning with the "weak" properties and ending with the "strong" properties (Stevens 1994 in: Kaczmarczyk 1995, p. 93).

Mazur (1996, p. 92) defines a measurement as *a channel of influences used to transfer information.* A measured object is chosen by the author to be the beginning of the channel. The end of the channel is a researcher. Between them there is a measurement instrument (tool). Mazur underlines that each research process implemented in such a way is dependent on a researcher's senses strengthened only with a measurement instrument. If sight is used in observation, visual impressions will be expressed as e.g. dirty, ugly, grey, etc. Such adjectives are

collectively referred to by means of an umbrella term, e.g. "unaesthetic". Such a term is labelled a variable and words which characterize it are a variable's values. Grupiński (1981) precisely defines the general term as *a variable of a specific set of values by means of which we specify a given thing*. An example of distinct variables specifying a positive attitude of a person evaluating a product prototype might be the following categories: excitement, exhalation, emotion, enthusiasm. For measuring similar variables, devices registering emotional excitement can be used. They include: a psychogalvanometer, an electrooculography and an electroencephalograph.

A fundamental problem of a measurement is to determine clear principles of assigning numbers to measured traits of qualitative phenomena. The starting point of a measurement is the selection of a combination of appropriate measurement scales. Therefore, a measurement does not directly concern people, things or states but features of listed categories.

A measurement of quantitative features differs in the level of complexity from analyzing qualitative features and is simpler if a researcher takes time to choose an adequate research method and a measurement instrument. Studying qualitative features is in this sense more complicated. It entails the inability to compare differences between respondents which can be affected by immeasurable subjectivism, personal factors, inaccuracy and inconsistencies in the description of the rules for interpreting obtained information. The classification of qualitative and quantitative features of marketing research subjects is shown in illustrations …..

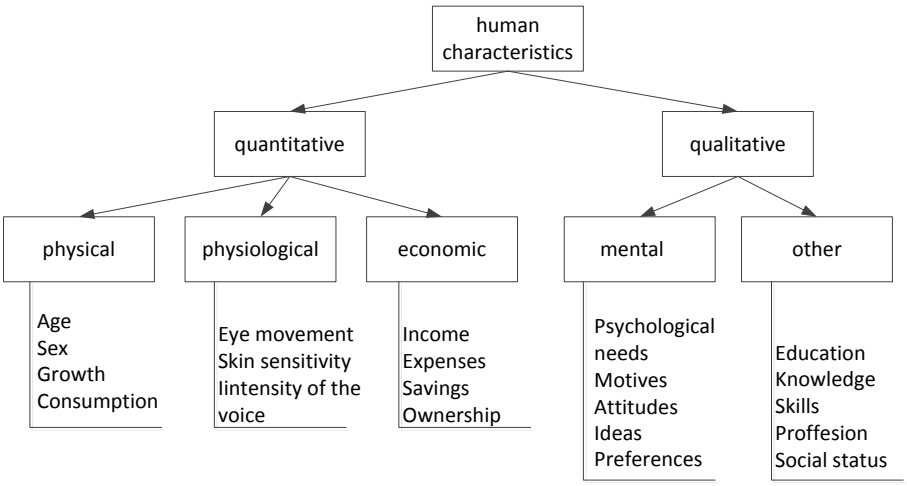

Illustration 18.1. Human quantitative and qualitative features forming an object of measurement in marketing research.
Source: (Wi□cek-Janka 2000)

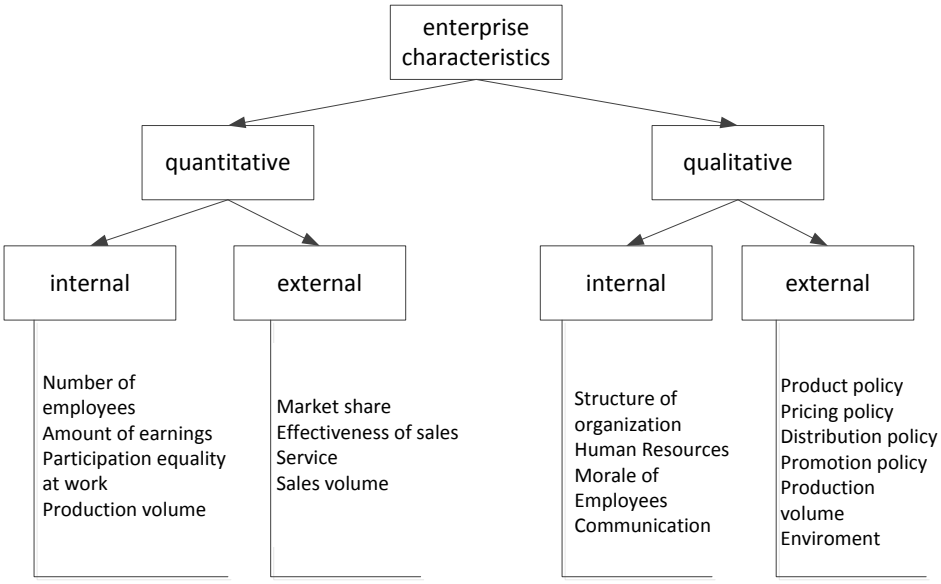

Illustration 18.2. Company quantitative and qualitative features forming an object of measurement in research.
Source: (Wi□cek-Janka 2000)

18.3. Object of research

A measurement cannot function as a separate isolated activity. It is an element of a measurement process which consists of several stages. At the first stage, a measurement instrument receives specific signals provided by an object of research (a research unit). At the second stage, the measurement instrument changes the obtained signals into data, which is collected by a researcher. At the third stage, a researcher converts data (in the way described above) and locates it in a proper carrier (Kaczmarczyk 2003, pp. 91–100).

Inside the process, a communication channel can be observed, which is a factor that forms a measurement (form of measurement). The used manner of data transfer determines the choice of method and a precise description of a measurement instrument (Warren 1983).

An essential condition of the optimum construction of measurement instruments is the application of appropriate scales (instrument calibration).

18.4. Levels of measurement

Levels of measurement are tied with the scaling process, which should be understood as the activity of representing a measured feature by means of a selected scale. Each level of measurement contains all features and properties of measurements from lower grades. Kaczmarczyk defines scales (2003, p. 106) in the following way: *A scale is a model of real phenomena and their relations. Scales are built assigning symbols to measured features in accordance with specific rules.* Scales are an integral part of a measurement instrument, they are not an instrument itself. The criterion of dividing scales is a degree in which they reflect real features. Four types of scales can be distinguished with repect to the way of presenting statistical measurements.

Nominal scales

They allow to ascertain different or equal states between measured features. The basis are qualitative, and not quantitative, features of phenomena. Nominal scales are divided into alternative (with a bipartite classification, e.g. woman – man; yes – no, etc.) and non-alternative (with a multipartite classification, with at least three classes). A singular feature of this scale is, unlike other scales, is a free sequence of classes, accommodating all possible cases of answer and separability (one case cannot be accommodated in two or more classes).

For analyzing data from a nominal measurement, the following are used: proportions, interest, rates, growth rate and others. A nominal scale allows to divide the whole set of the results of statistical research into disjoint subsets (that is the ones which do not have common elements) and single out units with respect to possessing or not possessing a certain feature. In this scale, a number or a label is assigned to particular variants of features. An important characteristic of a nominal scale is the lack of possibility to order particular features in an evaluative sequence.

Examples where a nominal scale can be used include: subscribers' telephone numbers, types of securities, type of business, type of finished school, etc.

Ordinal scales

They not only allow to reproduce equalities and diversities but also to order measured features. In research work we can distinguish the following types of ordinal scales:

- unipolar,
- bipolar,
- discrete,
- continuous.

The construction of a unipolar scale consists in one pole being negative towards the other (e.g. strong – not strong). The construction of a bipolar scale consists in one pole being the opposite of the other (e.g. strong – weak). Gradual scales, regardless of poles, are divided into several grades in the form of intervals, without keeping equality between intervals (e.g. very big – big – medium – small – very small). Continuous scales have no distinct grades. They are a certain form of continuum from the highest grade to the lowest grade or the other way round (e.g. good – bad).

The mode and median, but not mean, are used for the analysis of data obtained from an ordinal measurement. An ordinal scale allows to order the units of statistical population in a size sequence and to determine the degree of intensification of a given trait in population. With the help of this scale, statistical traits can be specified and assigned one of the following: equal, bigger than, smaller than.

If numbers are used in an ordinal scale, such an activity is called ranking. Examples of where an ordinal scale can be used are: company's creditworthiness (high, medium, low), product price (high, medium, low), customer satisfaction (high, medium, low).

Interval scales

Apart from determining relations of majority and minority, they allow to determine equality between scale intervals. Examples of interval scales include temperature scales

and a calendar. Data obtained from this type of scales can be processed, calculating the arithmetic mean, standard deviation, correlation coefficients. An interval scale allows to determine a difference between scale degrees with certain accuracy and the distance between elements of a set. Zero in this scale is imaginary, set by a person creating a given interval scale. A characteristic feature of an interval scale is the possibility to add and subtract input data(Zeliaś, Pawełek, Wanat 2013). An example of a feature which can be measured thanks to an interval scale can be, e.g. temperature. The Celsius scale or the Fahrenheit scale allow to determine a difference in temperature (e.g. the diurnal temperature amplitude).

Ratio scales

Referred to also as quotient or proportional scales, they allow to make measurements at the highest level. This is made possible through the existence of a natural measurement unit and a natural zero point (e.g. expressing a value in percentage). A ratio scale is used for comparing measurements and calculate their ratio. Data obtained from ratio scales can be processed by all available methods of descriptive statistics. As regards values, a quotient scale enables to obtain exact differences between research statistical characteristics. This scale has a zero, which does not depend on a person conducting statistical research. All arithmetic operations can be performed on a quotient scale (e.g. multiplication and division). It is used only with quantitative features, including continuous and discrete features. Examples of features which can be measured by means of a quotient scale include: company profit, number of employees, price of a barrel of oil, indexes in relation to specific values. Table 18.1. Shows the characteristics of measurement scales along with the typical examples of use.

Table 18.1. Characteristics of measurement scales (own work)

SCALE	BASIC COMPARISONS	TYPICAL EXAMPLES	EXEMPLARY AVERAGE MEASUREMENTS
NOMINAL	Identity (something happened or not, all possible answers – including, e.g. "others, if so, what kind...")	Woman - man User – non-user Professions Uniform numbers	Mode (dominant trait, with a numerical interval; comparison of results)
ORDINAL	Order (what is the best, worse, the worst - numerically)	Brand preference Social class Mineral durability Quality classes of wood	Median (medium value)
INTERVAL	Comparing objects (in values which can be calculated; the same phenomenon can be described by means of different scales)	Temperature scale Overall grade point average Attitude towards brands Advertising awareness	Arithmetic mean (total sum over quantity)
RATIO	Comparing absolute values (when things are in different scales, they must be brought down to one scale)	Number of units sold Number of buyers Purchase probability Weight	Geometric mean Harmonic mean

18.5. Principles of using measurement scales

Balanced and unbalanced scaling

Balanced scaling requires the establishment of a median class and an identical number of classes (intervals) of identical intensiveness on both sides of the median class. It is used in research where an essential answer is, e.g. *neither agree nor*

disagree or *neither this nor that*. The application of such a scale may suggest that an investigated phenomenon ranks as a taboo issue or is not known well enough among the respondents.

If on both sides of a median class, there is a different number of classes or classes of different intensiveness, such scaling is called unbalanced scaling. It is used when a researcher wants to obtain specific opinions and evaluations of research traits (cf. table 18.1, 18.2)

Table 18.2. Characteristics of balanced and unbalanced scales (own work)

Scales	**Balanced scales**		**Unbalanced scales**	
	Question	Example	Question	Example
Ordinal scale	How do you rate our trade rep's competence?	– Very good – Good – Neither good nor bad – Bad – Very bad	What was your reaction to launching our new software for our products?	1. Enthusiastic 2. Very positive 3. Positive 4. Indifferent 5. Negative
Interval and ratio scale	What portion of the revenue from sale goes towards internal promotion activities?	– 0-2% – 2-4% – 4-6% – 6-8% – over 8%	How many times did you travel by EuroCity trains last year?	– None – Once – 2-4 times – 5-9 times – 10-19 times – 20 times and more

18.6. Graphic form of a scale

Categories of a given scale may be described verbally, numerically, graphically or in a combined way. The more exact the description of scale categories, the more reliable the measurement. The graphic form of a scale is adjusted to the specific character of a group of respondents – it will be different for adults, different for school youth, different for kindergarten kids.

Number of scale categories

The number of categories between the poles of a scale depends on a respondent's attitude, a form of measurement and a method of data analysis. Usually, if a

researcher wants to find out more about attitudes, he/she should use five or seven categories, e.g. very good; good; neither good nor bad; bad; very bad.

Even or odd number of categories

Choosing this number determines whether a scale will have a middle, neutral position. Advocates of using an even number of categories argue that attitudes cannot be neutral. It is worth remembering that respondents tend to choose categories which are nearer the middle. Hence, counterbalancing a scale will cause a certain number of respondents to choose this category of answer.

Forced and non-forced scaling

Forced scaling aims to bring a respondent to express a precisely defined category on an answer scale. In the case of a respondent not being able to express his/her attitude, non-forced scaling is used, e.g. addressing a request to express one's opinion about EuroCity trains in comparion with other railway operators, a scale should start with an answer "do not know" for people who have never used operators other than EuroCity.

18.7. Summary

The application of measurement scales adequate for a research aim significantly simplifies and accelerates a research process as well as coding and analyzing obtained data. A measurement of specific features is not always connected with scaling but in most part refers to measurable variables and often uses a natural form of scaling and categorizing data.

Control questions

1. What is a measurement?
2. Describe quantitative research features of a human.
3. Describe qualitative research features of a human.
4. Describe quantitative research features of a company.
5. Describe qualitative research features of a company.
6. Describe research objects (measurement objects) in marketing.
7. Enumerate and describe measurement scales.
8. What statistical measures can be calculated using particular measurement scales?
9. Enumerate and discuss the principles of using measurement scales.

19. DATA REDUCTION, EDITING AND CODING

19.1. Introduction

A measurement provides a researcher with *raw data* in various forms (from observation, interview, experiment surveys). In marketing research, the most frequent forms are: classic questionnaires, electronic questionnaires from surveys and interviews, video recording of observations and experiments, registration of physiological measurements, etc. The next steps which precede analysis are data reduction, editing and coding. Thanks to such measures, a researcher obtains a set of *pure data.*

19.2. Work on raw data

The first and fundamental activity involved in the stage of processing results is data reduction. During this stage, a researcher performs a set of activities connected with measurement control, data reduction, editing, coding, classification and tabulation. At this stage, correct answers are selected through the elimination

of extreme and non-typical cases which can distort the picture of research results. During the process of data reduction, also a symbolic treatment takes place. It consists in symbolizing, coding, decoding and processing data with regard to various analytical ranges and it is most often carried out by means of IT equipment and dedicated statistical software[8].

During this stage, control is additionally performed. Its aim is to make sure that the whole research and measurement process has been implemented and organized in an appropriate way and data, on the basis of which analyses will be performed and conclusions drawn, reflect real facts pertaining to a research problem (Tull, Hawkins 2013; Mazzocchi 2008; Mynarski 2000; Kujawińska, Więcek-Janka 2011; Chakrapani 2009; Adamkiewicz-Drwiłło 2008; Warren 1983).

Another activity is to perform data editing. An editor's main task is to check obtained data, bearing in mind its clarity and accuracy, as well as to introduce indispensable corrections and supplements wherever it is necessary and feasible. As a result of editing, data obtained is verified and selected so that it is useful from the point of view of a research problem. Reduction is a process of adapting raw data to be analyzed. This preparation is realized in both formal and technical aspects. The result of reduction activities is ordering and a preliminary presentation of data in descriptive, tabular and graphic forms.

Classification and calculation take place according to criteria compliant with research aims (e.g. price, sales volume, level of customer satisfaction). After classification, data is calculated either manually on separate sheets or by means of computers.

The tabulation of classified and calculated data consists in transferring it into sheets where data is presented in the form of statisitical series.

The process of data ordering and reduction ends with calculating summary statistical measures. In marketing research, three groups of measures are used:

- measure of central tendency,
- measure of dispersion (scattering),
- measures of structure and intensity.

[8]IT statistical tools: Statistica StatSoft; PQstat; Origin 9.1; SPSS Statistics; Excel.

19.3. Errors and their causes

At the stage of reduction, errors are tracked down and questionnaires in which they are found eliminated. The basic errors causing reduction are:

- Lack of answer legibility is an error which makes it impossible to read information contained in survey (interview) questionnaires.
- Questions without answers are caused, among other things, by:
  - Omitting by a researcher or, in the case of survey measurements, by a respondent whole pages of an interview sheet .
  - Refusing to answer certain questions or refusing to be subject to measurement.
- Fictitious measurement consists in survey or interview questionnaires being willfully completed by a researcher.
- Inadequate, unrelated answers provided by respondents.
- Contradictions and inconsistencies. An example might be an answer from which it follows that a respondent has never heard of a given product, whereas answering another question he/she claims that he/she uses this product. Which answer is correct may sometimes be concluded from other answers, but conclusions can be risky.
- Incomplete and ambiguous answers. Some answers are incomplete, illegible, unclear and ambiguous. An incomplete answer may be roughly specified and completed. However, ambiguous and unclear answers are difficult to interpret and correct.

19.4. Coding

An essential activity at the stage of data reduction and editing is the process of coding pure data. Coding is often classed as a marginal activity of minor importance. This is an incorrect opinion. The credibility of research results depends on the way data is coded. Data obtained as a result of measurement does not offer many possibilities of analysis and drawing conclusions. In the course of research, answers are provided to various questions. They, however, cannot be subject to statistical analysis in such a state. Coding makes such activities possible. The process of coding a survey questionnaire consists in changing text-based data into numerical data, which can then be subject to further analysis (Tull, Hawkins 2013; Mazzocchi 2008; Mynarski 2000; Kujawińska, Więcek-Janka 2011; Chakrapani 2009; Adamkiewicz-Drwiłło 2008; Warren 1983).

The coding process begins at the moment of developing a code book which takes into account all positions of a research tool (a questionnaire, an observation sheet, etc.). A code book contains a description of research variables along with codes assigned to them. Developing a code book facilitates and accelerates coding. It also helps in further analysis to efficiently find and interpret variables. A code book for closed questions can be developed on the basis of a survey or interview questionnaire only. Questions and possible answers will be made known in advance. In principle, coding then consists in "matching" a respondent's answers to appropriate codes.

Table 19.1. Example of entry in a code book (own work)

Number of question in the questionnaire	Number of research variable	Name of variable	Variable label	Code
1	1	P1	sex	1=man 2=woman
2	2	P2	satisfaction	1=very low 2=low 3=medium 4=high 5=very high
3	3	P3.1-P3.3	values	1=prosperity 2=fame 3=power 4=quiet life 5=intersting job 6=people's respect 7=family love 8=religion 9= other, what kind?

The choice of a measurement scale determines the possibilities of using codes. In dichotomous questions (a type of closed questions where a respondent may choose only one answer out of those given), answers exclude each other. A respondent may choose only one answer (markng it with sign "X" in accordance with

instructions to a question) out of two presented: *yes* or *no* with codes 1 and 2. Another example is sex Woman – 1, Man – 2.

In cafeteria-style questions, a respondent may choose one or more answers out of those presented. A cafeteria-style checklist is a list of possible answers to a closed or half-open question, which is added to this question in a questionnaire. A cafeteria-style checklist can be disjunctive, where a respondent may provide only one answer out of all possibilities, and conjunctive, where a respondent may select more answers. It consists in, among other things, assigning to answers natural numbers in a given sequence. A similar situation takes place in the case of scaled questions where numerical scales are assigned to answers.

Using open questions in research is connected with difficulty in analyzing them. Respondents, especially in survey questionnaires, enter various answers, sometimes completely irrelevant as far as the subject matter of a question is concerned. Moreover, a few problems may appear in one question with each of these having to be coded and later analyzed. A list of codes for an open question should be created during the construction of a measurement instrument with a precise definition of a research aim. A list of codes in an open question is by no means limited and depends exclusively on a researcher's suggestion. Its selection should be connected with a research aim. The coding plan can be expanded or simplified. It all depends on a specific character of research, "importance" of a question and information we want to obtain. If a coded question is not siginificant in research, a list of possible answers should be simplified. This will speed up the following process of data analysis. Before a list of codes is formed, it needs to be carefully planned as later changes or modifications might not be possible.

There are a few rules that need to be observed when creating a code book for an open question:

1. Codes should mutually exclude each other. There should not be a situation when one answer matches a few categories. In such a case, there are substantial grounds to believe that the categories are badly formed.
2. Answers containing diverse information should be broken up into smaller fragments which should be thematically coherent. Only after they have been distinguished, one may proceed to the process of coding.
3. Codes should be general in order to include all cases which touch upon a given question.

The application of open questions in a survey questionnaire considerably enriches a research tool. Answers provided then are often answers which cannot be obtained using a typical closed question. Respondents may point to problematic aspects which were not considered before while creating a survey. It needs to be remembered though that analyzing open questions entails a lot of problems.

19.5. Summary

At present, at the age of information age, coding answers in questionnaires aims to transfer data from a measurement instrument (e.g. a survey questionnaire) into computer memory (spreadsheet, database, etc.), which is supposed to shorten the time of data analysis and drawing conclusions.

Control questions

1. What is coding and what does it consist in?
2. What is a code book?
3. What does coding answers in disjunctive cafeteria-style checklists consist in?
4. What does coding answers in conjunctive cafeteria-style checklists consist in?
5. What does coding dichotomous answers consist in?
6. What does coding half-open and open questions consist in?
7. The principles of creating a code book for open questions.

20. DATA ANALYSIS AND INTERPRETATION

20.1. Introduction

Processing information using statistical methods is called the analysis and interpretation of research results. The analysis of obtained data and information comprises a set of activities aiming at characterizing a given phenomenon, feature, situation, process, etc. Interpretation, in turn, is the explanation of results, that is a specific thinking operation which consists in providing answers: why given facts happened and what is their meaning.

20.2. Analytical process

Prior to the analysis of the collected research material, the analytical process should be split into a preliminary analysis and a proper analysis. The aim of a preliminary analysis is to gain a general picture of a research feature and formulate postulates and suggestions regarding further analyses. A proper analysis allows to perform a full and complex evaluation of the collected research material

(Kujawińska, Więcek-Janka 2011). In the course of a proper analysis, the following methods are used:

- methods of statistical description, whose aim is a statistical description of a research population;
- methods of statistical inference, whose aim is to assess the parameters of a general population on the basis of information obtained from analyzing a given sample or to verify statistical hypotheses pertaining to a general population on the basis of information obtained in a research process on a sample.

20.3. Classification of analytical procedures

The fundamental criterion for the division of analytical procedures in marketing research is a number of variables subject to analysis. The criterion of a number of variables influences the division (Mynarski 2000) into:

- one-way analytical procedures,
- two-way analytical procedures,
- multi-way analytical procedures.

One-way procedures are used in the case of analyzing only one variable. The choice of a given analysis technique is closely related to a type of measurement scale, which is shown in illustration (20.1).

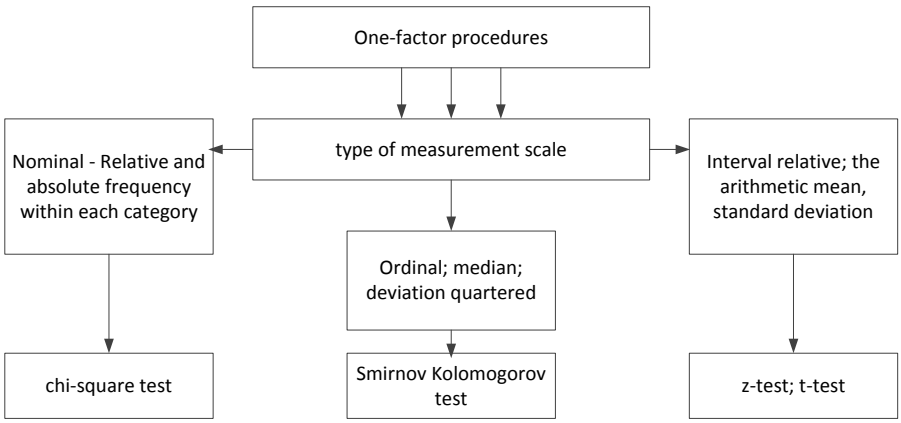

Illustration 20.1. One-way analytical procedures. Source: own elaboration on the basis of work Mynarski 2000

Two-way procedures are used in the case of a simultaneous analysis of two variables. The choice of an analytical technique is made on the basis of a measurement scale classification, which is shown in illustration 20.2.

Multi-way procedures refer to many variables and include a lot of analytical techniques of diverse character, which can be found in the illustration:

1. Independent research procedures, whose task is to identify relations arising between research objects, e.g. market segmentation;
2. factor analysis is usually applied to identify the structure of a research feature, phenomenon or process and allows to reduce a significant number of variables, determine the essence and strength of a relationship between variables, determine the number of variables described by singled out factors,
3. cluster analysis is most often used while identifying target markets and segmentation. It consists in forming groups of units, objects (e.g. segmentation analysis, product placement),
4. multidimensional scaling pertains to showing relationships arising between various elements (e.g. products, product brands) and presenting them in a graphic form of a perceptual map; they are used to identify product features which are the most essential for a buyer, determine market "gaps" and place products on the market.

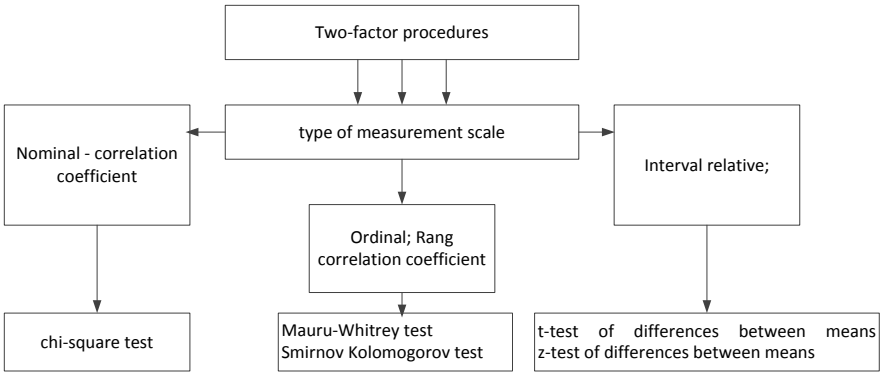

Illustration 20.2. Two-way analytical procedures. Source: own elaboration on the basis of work Mynarski 2000

5. Dependent research procedures. Their basic task is to determine the relations between research objects. To this end, a few factors are chosen as

dependent variables (e.g. sales volume and profit) on a set of remaining factors (e.g. company size, volume of promotional expenditure, company market share).

The following analytical techniques are used in the procedure of dependent research:

1. The analysis of multiple regression, which consists in determining a statistical relationship between dependent variables and a set of independent variables and includes finding a function showing a dependent variable as a function of independent variables, determining the strength of a relationship between independent variables and a dependent variable, determining statistical significance between variables and determining relative importance of each of independent variables
2. The procedure of Automatic Interaction Detector, which concerns detecting relationships exisiting simultaneously between a significant number of mutually independent factors; its main aim is to divide a research population into smaller and smaller groups so that factors could describe their properties as fully as possible; thanks to this method, the so-called dependency tree can be obtained, which shows the hierarchy of importance and the range of various factors in providing an explanation of a research feature, phenomenon or process.
3. Discriminant analysis. Its fundamental aim is to find a function by means of which a dependent factor is shown as a linear combination of independent factors. Thanks to such an analysis, it is possible to determine the significance of differences between the investigated objects and to identify independent factors which contribute to the largest spreads.
4. Multi-way measurement, which concerns the analysis of a simultaneous influence of two or more factors on a dependent variable. The aim of such a measurement is to determine a function between a dependent variable and independent factors and the strength of a relationship between them.

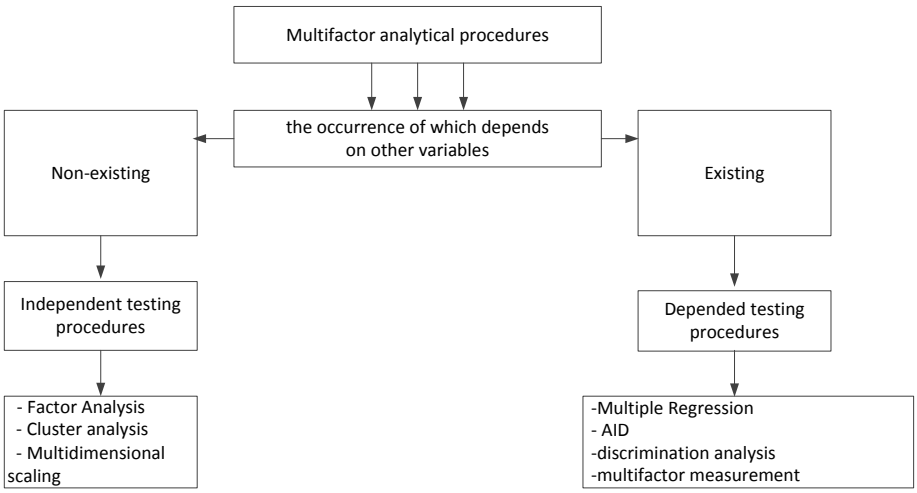

Illustration 20.3. Multi-way analytical procedures. Source: own elaboration on the basis of work Mynarski 2000

20.4. Statistical methods in data analysis

Descriptive statistics deals with processing data obtained during research without using the probability calculus. It is a collection of methods and tools which allow to present data in as transparent way as possible. The tools of descriptive statistics may include:

- Tabular description in which data is presented in the form of tables. For small samples, tables presenting all data in various arrangements can be created. What is often presented is the values of a feature and their frequency (the so-called positional series). In the case of a large amount of data, various kinds of summary are created, such as a stem-and-leaf-display.
- Graphic presentation of results. The fundamental tools include various charts created on the basis of data, e.g. a box-and-whisker plot, a histogram, a frequency polygon and a frequency curve, the Lorenz curve.
- Determining statistical measures. Measures are indexes which allow to determine the central tendency of a set of data, their variability, skewness, symmetry etc. Statistical measures provide the first information about the character of the distribution of a feature in a set.

The starting point for the classification of statistical features is distinguishing measurement scales (described in chapter 18). Below are their fundamental variations:

- Nominal scale: values on this scale are not evidently ordered (e.g. determining colours, names of countries, specifying product quality, etc.).
- Ordinal scale: values on an ordinal scale have a clearly specified order but distances between them are not determined (e.g. education, quality classes, etc.). Apart from equality, order relations are possible: minority, majority, etc.
- Interval scale: this scale has the properties of an ordinal scale because it is possible to order units and determine a numerical interval in which observations are accommodated. Zero is arbitrary (e.g. Celsius temperature). It is possible to perform arithmetic operations such as addition and substraction. Differences between values can be rationally interpreted but their quotient cannot (e.g. date).
- Ratio scale: has the properties of an interval scale with the reservation that the quotient here is specifically interpreted. In a ratio scale, absolute zero can be found. An example is mass (something can be twice as heavy) or Kelvin temperature.

Conducting research requires a researcher, already at the stage of research design, to specify assumptions connected with using statistical methods. For this reason, it is important to specify clearly what kind of features of a research object we will deal with (cf. chapter 18). Hence, the fundamental classification of features is the possibility of measuring. Thus, we have measurable and non-measurable features.

Measurable features are values which can be expressed by means of numbers and they can be measured. A measurement can be expressed in various units, e.g. value in USD, weight in tonnes, sales in individual items, etc. They have a various level of intensity in various population units. Measurable features can be divided into (Kujawińska, Więcek-Janka 2010):

1. Continuous features, when they adopt optional values form a specific interval, e.g. an opening diameter, mass of a product, etc. Values of such a variable theoretically create an unaccountably infinite set;
2. Discrete features, when they adopt values from at most countable set, e.g. number of discrepancies in a product lot, number of accidents reported in a hospital on a given day, etc.

Non-measurable features are features which cannot be measured and it can only be ascertained which variant of a feature is present in a given population unit or sample. Examples include sex, profession, colour. Non-measurable features can be divided into:

- nominal: features are described on the basis of a certain admissible set of nominals. A verbal description is used here; an example might be: sex with two possible values: woman and man.
- ordinal: features are described on the basis of an ordinal scale; an example might be: ranking of family microbusinesses from the point of view of resources held, classification of products in three quality classes: low quality, medium quality, high quality.

20.5. Statistical measures

Statistical measures are values calculated on the basis of obtained data. The interpretation of the values of these measures provides information about certain properties of a feature distribution. Statistical measures are most often divided into several basic groups (Kujawińska, Więcek-Janka 2010):

- measures of distribution (including measures of central tendency: e.g. arithmetic mean, geometric mean, median, mode, etc.),
- measures of variation (e.g. standard deviation, variance, range, etc.),
- measures of asymmetry (e.g. coefficient of skewness, coefficient of asymmetry, the third central moment, etc.),
- measures of concentration (e.g. kurtosis).

Measures of central tendency are values of a research feature round which data is grouped. In other words, what is looked for is a representative of a feature round which there is the highest concentration of results. Measures of central tendency include measures of distribution from a set such as percentiles (quartile I, quartile II-median, quartile III), means, mode.

A measure of variation describes a relation between distributions which differ in the dispersion of the values of a feature around central values. Examples of measures of variation for distributions are:

- standard deviation (standard deviation informs how much values of a given amount are dispersed around its mean)
- variance (associated with population diversity)
- mean absolute deviation (it is an arithmetic mean from absolute deviations for all elements of a set of statistical data),
- coefficient of variation (relative measure, that is dependent on the value of the arithmetic mean)
- range (it is a difference between the biggest and the smallest value in a set of results),
- interquartile range – it is a difference between the third and first quartile),

– quartile deviation (it is a half of the interquartile range, that is a difference between the third and first quartile).

A measure of concentration points to an unequal distribution of the value of a feature between the elements of a sample. The best-known measures of concentration include, among others, kurtosis (a measure of the peakedness of the distribution of the value of a feature).

20.6. Arithmetic mean

The arithmetic mean is the most popular measure of the average level of a numerical feature. The following is the description of the way of calculating the mean for a detailed statistical series.

Example

Value of a feature	10	15	9	11	4	7	13	15	14
(x_i)	x_1	x_2	x_3	x_4	…	x_{n-3}	x_{n-2}	x_{n-1}	x_n

20.7. Median – central value

An alternative method of describing numerical data is the middle value (median), which is a reflection of the level of a unit in the middle of a research population as far as the level of a feature is concerned. In order to find the median, the detailed series must be ordered in an ascending way and the value of a central object must be specified.

Example

Value of a feature	4	7	9	10	11	13	14	15	15
(x_i)	x_1	x_2	x_3	x_4	…	x_{n-3}	x_{n-2}	x_{n-1}	x_n

Me=11

The simplified definition and interpretation of the median may consist in the claim that 50% of measurements is less that the median and 50% of measurements is greater than the median.

Which is better – the median or the mean?

The median and the mean may have similar values. They may also be entirely different. In practice, it is advisable to determine these values at the same time and drawing conclusions on the basis of their simultaneous analysis.

Example

Earnings in a given company stood at the following levels before and after a pay rise.

Range	1 person	2 person	3 person	4 person	5 person	mean	median
Before a pay rise	1000 PLN	1200 PLN	1400 PLN	1700 PLN	30000 PLN	7060 PLN	1400 PLN
After a pay rise	1100 PLN	1400 PLN	1700 PLN	2000 PLN	60000 PLN	13240 PLN	1700 PLN

Average earnings do not always reflect the real picture of a research variable. It is worth knowing the median to complete the context of the situational evaluation.

20.8. Centiles

The median is a value which we find as a result of looking for an answer to the question: *below (above) what value 50% of measurements is situated.*

In many situations, an analyst is also interested in the question *below (above) what value another part of measurements (1%, 5%, 10% or 25%) is situated.* This statement defines a group of measures called *centiles.*

The centile in the rank of *p (c)* ($0 < p < 1$) is the number below which there is the p-th part of measurements and above the (1-*p)*-th part of measurements. The value of *p* is often given in percentages.

The classification of centiles

Some centiles, due to the popularity of applications, have their own names:

- c_{50} is the median;
- c_{25} is the lower quartile (Q_{25}) a c_{75} is the upper quartile(Q_{75});
- c_{10}, c_{20}, ..., c_{90} are the so-called deciles (marked also as d_1, ..., d_9).

Example

Research was conducted on the lifespan of women in 220 countries in the world. The findings are in the table

Descriptive statistics (lifespan of women in 220 countries in the world)										
Variable	N significant	mean	median	minimum	maximum	lower quartile	upper quartile	standard deviation	Coefficient of variation	skewness
Women 2010	220	69.3	72.2	33.1	94.3	60.3	75.4	11,5	15,8	-1.1

Interpretation

N significant – data from 220 countries was analyzed

Mean – average lifespan of women in the analyzed countries

Median – in one half of the countries an average lifespan of women does not exceed 72 years

Minimum – the shortest average lifespan of women was 33 years

Maximum – the longest lifespan was 94 years (which means that in some countries women live on average three times as long)

Lower and upper quartile – in every fourth country an average lifespan of women does not exceed 60 years and also in every fourth country the result is higher than 75 years.

Standard deviation – deviation from the mean for all countries in the world is 11.5 years

Coefficient of variation – the level of variation is almost 16%

Skewness – the coefficient of skewness is negative, which means that the distribution of an average lifespan of women is characterized by the left-skewed asymmetry – in other words, in most countries it is high, in a few countries it is low or even very low.

20.9. Selected probability distributions

Normal (or Gaussian) distribution

The normal distribution is one of the more important probability distributions of a continuous random variable. It follows from the fact that normal distribution is a limiting distribution of many other distributions in situations where the results of various incidental factors arising from a variety of sources emerge. As an example, the normal distribution is a distribution which, among others, the binomial distribution tends to when the number of experiments n increases. Likewise,

repeating an experiment many times, it is possible to get a little different result each time, but all of them will be distributed normally.

Random variable X has a normal distribution if its probability function is denoted by means of the following formula:

$$(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

Parameters μ (average value) and σ (standard deviation) influence the shape and position of function.

Parameter μ is an average value in the population with respect to which the distribution is symmetrical. Parameter σ is a standard deviation, which is a measure of dispersion around the mean μ. Parameter μ decides about the position of a curve in relation to the horizontal axis (0X), whereas the pointedness of a curve depends on parameter σ. The influence of these parameters on the position and form of a normal curve is shown in illustration 20.4. Most often we do not know the real values of these parameters but we estimate them on the basis of calculating the mean and standard deviation of a sample.

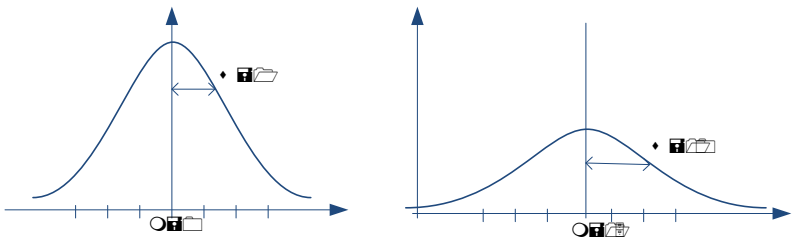

Illustration 20.4. The shape of the Gaussian distribution for various expected values and variances (source: Kujawi□ska, Wi□cek-Janka 2010, p.46)

The maximum of this curve falls in point μ, and the inflection point in point s. The curve is symmetrical in relation to the line which goes through μ.

There are a lot of normal random variables. Through appropriate transformation, each random variable can be brought to the so-called standardized variable. A standardized variable is a variable of a normal distribution of the expected value equal to 0 and standard deviation equal to 1, which is written as **N~(0. 1)**, and the

standardized variable is denoted by **U**. The transformation of random variable X of a normal distribution N~(μ, σ) of the mean μ and deviation σ into the standardized random variable (illustration 20.5):

$$U = \frac{X - \mu}{\sigma}$$

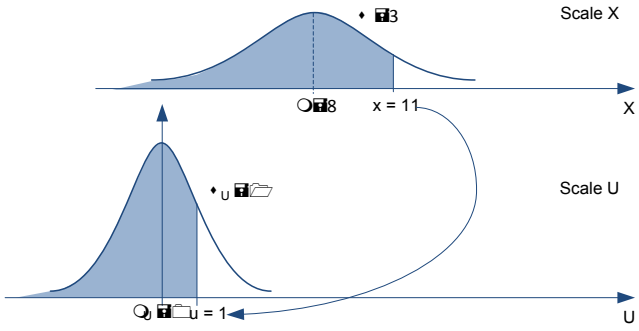

Illustration 20.5. The idea of the transformation of random variable N(8.3) into standardized normal random variable N(0.1) (source: Kujawi□ska, Wi□cek-Janka 2010, p.46)

Student's t-distribution

Another important distribution of a continuous random variable is Student's t-distribution[9].

If we have two random variables:

– U of a normal standardized distribution and

– χ^2 of the mean equal to *k* and standard deviation

the random variable:

$$T = \frac{U}{\chi^2}\sqrt{k}$$

has a *Student's t-distribution* of *k* degrees of freedom.

Student's t-distribution is a distribution characteristic of small sample sizes (*n*).

[9]pseudonym of English statistician W. Gosset

It is characterized by degrees of freedom denoted as *k* or *df*.

The shape of the density function of distribution *t* resembles a normal distribution. However, it is characterized by greater uncertainty than a normal distribution.

The average value of Student's t-distribution is equal to 0 and its variance with *df>2* is equal to *df/(df-2)*.

As number *df* increases, variance *t* nears unity, i.e. the variance of distribution N~(0.1). An example of a student distribution is shown in the illustration below.

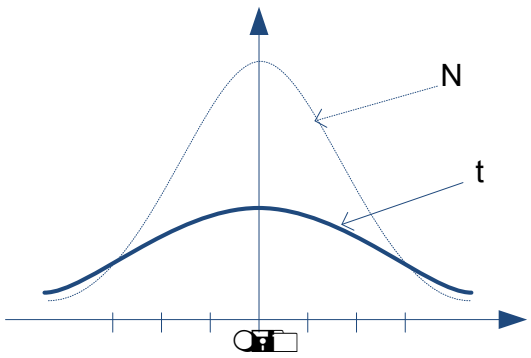

Illustration 20.6. Example of Student's t-distribution curve (source: Kujawi□ska, Wi□cek-Janka 2010, p.49)

Chi-squared distribution

The χ^2 distribution (chi-squared) is a probability distribution of the sum of squares of independent, standardized, normal random variables. The distribution accepts only positive values and is right-skewed (illustration 20.7).

This distribution is characterized by the so-called number of degrees of freedom df. The mean of the distribution is equal to the number of degrees of freedom df. Variance, in turn, is equal to the number of degrees of freedom multiplied by two (2df). As number df increases, the χ^2 distribution nears the normal distribution of the following parameters: μ = df and σ = 2df, N~(df, 2df).

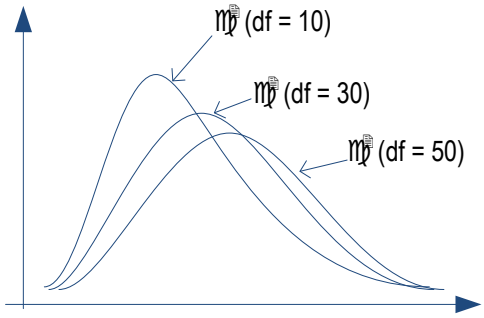

Illustration 20.7. Example of a probability density curve of χ^2 distributions (source: Kujawi□ska, Wi□cek-Janka 2010, p.49)

20.10. Applications of statistical tests

The chi-squared test

In general, conformance tests refer to the verification of hypotheses about the theoretical distribution of a research random variable. The aim of the test is compare the empirical (observed) distribution of a given feature with the theoretical distribution and checking whether the said distributions differ markedly from each other or not. The idea is – if the empirical and theoretical distributions are "the same" (close), it means that numerical values of specific statistics should be "slightly" different. Otherwise, we may conclude that the analyzed feature has a different distribution from the assumed theoretical distribution (Kujawińska, Więcek-Janka 2010).

The most frequently used test is the chi-squared test. The chi-squared test has the following procedure:

- a certain assumption regarding a population is formulated by setting up the null hypothesis and an alternative hypothesis,
- theoretical relative frequencies of certain events are calculated. They are in assumed classes ($i=1,2..k$), that is the ones which can be expected assuming the trueness of the null hypothesis. Thus, expected amounts (theoretical, hypothetical) E_i of data in various classes are obtained,
- the observed (empirical) amounts of data O_i belonging to particular classes are recorded,

- the difference between what is expected and what is observed is calculated – then the statistic values of the chi-squared test are calculated from these differences:
- the value of the calculated statistic is compared with the critical points of the chi-squared distribution[10] and if the calculated value:

$$\chi_n^2 = \sum_{i=0}^{k} \frac{(O_i - E_i)^2}{E_i}$$

a decision is made to reject the null hypothesis.
where:
α – level of significance,
df – number of degrees of freedom which are specified separately in each situation; they can be equal *df=k-p-1* where: k is the number of classes, p is the number of parameters estimated on the basis of a sample

Example
The number of road accidents reported on a given day in one of large towns in Wielkopolska (random variable X) within 120 days was the following:

Number of reports (x_i)	Days (Oi)
0	8
1	13
2	29
3	26
4	23
5	15
6 and more	6

At the level of significance 0.05, verify the hypothesis that the daily number of reports is a feature which can be described by means of a Poisson distribution.
The following hypotheses were formulated:
H_0: The daily number of reports has a Poisson distribution

[10]**NOTE:** If the expected numerical size of certain classes is too small, the test statistic may not have a chi-squared distribution. Therefore, it is assumed that this distribution can be used as long as the expected numerical value in each class is equal to at least 5.

H_1: The daily number of reports does not have a Poisson distribution

In order to verify the proposed thesis, we will use the chi-squared goodness of fit test. In order to specify the test statistic, assuming the trueness of the null hypothesis (here: the variable has a Poisson distribution), we must calculate theoretical relative frequencies of consecutive events x_i of random variable X (here: daily number of accident reports).
To this end, we may use the table of the Poisson distribution. The first step is to specify an average number of accidents reported on a daily basis.

Number of reports (x_i)	Observed relative frequencies (O_i)	$O_i \cdot x_i$
0	8	0
1	13	13
2	29	58
3	26	78
4	23	92
5	15	75
6 and more	6	36

$$\mu = \frac{\sum O_i \cdot x_i}{n} = 2{,}93$$

From the tables of the Poisson distribution we read probability p_i, that the random variable will adopt a given value x_i, with the expected value μ=2,9.

Number of reports (x_i)	p_i from the tables of the Poisson distribution	Theoretical number of days (E_i)
0	0.0550	6.600
1	0.1596	19.152
2	0.2314	27.768
3	0.2237	26.844
4	0.1622	19.464
5	0.0940	11.280
6 and more	0.0741	8.892

The theoretical number of days E_i, is specified as a product of p_i and 120.
So the value of the test verification:

From the tables of the chi-squared distribution we read the value χ^2_α, that $P(\chi^2 > \chi^2_\alpha) = \alpha$.
The critical area with the level of significance α=0.05 and df degrees of freedom: df=k-p-1=7-1-1=5,
is: $R\alpha$: (11.07; + ∞)

Because the test statistic χ^2=4.719 is less than χ^2_α=11.07, there are no grounds for rejecting the null hypothesis. We conclude that the daily number of reported accidents in a given city has a Poisson distribution.

The λ Kolomogorov test

The Kologomorov test is less labour-intensive but also less versatile. It is only used to verify hypotheses in which we take interest in populations of a continous distribution. In the test, like in the goodness-of-fit test, the empirical distribution function is compared with the hypothetical distribution function.

The λ- Kolmogorov test is used to verify the following hypothesis: a certain random variable has a continuous distribution of the following distribution function .

The trueness of hypothesis is investigated on the basis of the results of an n-element random sample.

The significance test is the following:

2. The sampling results are ordered according to the ascending sequence of random variable X. (we record values x_i with corresponding numbers n_i)

b) Next, for each value x_i, the value of empirical (observed) distribution function is defined, where

c) Assuming the trueness of the null hypothesis, the value of a theoretical distribution function F (x) is set for each value x_i from a theoretical distribution $F_n(x)$, gdzie $F_0(x) = \frac{\sum_{i<k}^{n} n_i}{n}$

d) The next step is to calculate the absolute value of the difference between a theoretical and empirical distribution function: $|F_n(x) - F(x)|$

– The value is calculated:

$$D = \sup_n |F_n(x) - F(x)|$$

and the value of statistic: $\lambda = D\sqrt{n}$

– For the established level of significance α, the critical area of statistic is βυιλτ λ φροµ τηε ***λ– Kolmogorov test*** and a decision is made whether to reject the null hypothesis or not.

Example

Randomly chosen students were analyzed with respect to the level of expenses on sport and tourism on a weekly basis and the following results were obtained (USD).

Expenses	Number of students
29,5 – 30 ,5	12
30,5 – 31,5	23
31,5 – 32,5	35
32,5 – 33,5	62

33,5 – 34,5	44
34,5 – 35,5	18
35,5 – 36,5	6

At the level of significance α=0.05, verify the hypothesis that the distribution of expenses on sport and tourism in a group of students is a normal distribution.
A pair of hypotheses:
H_0: Distribution of expenses is a normal distribution
H_1: Distribution of expenses is not a normal distribution
From the sample we calculate the estimation of both parameters of a normal distribution, receiving: and . Because the sample is large, these values are adopted as estimators μ and σ. Calculations necessary to find the empirical and theoretical value of a distribution function can be found in the following table.

x_j	u_j	$F(u_j) = F(x)$	n_j	$\sum_{j<k} n_j$	$F_n(x)$	$\lvert F_n(x) - F(x) \rvert$
30 ,5	-1,71	0,044	12	12	0,060	0,016
31,5	-1,00	0,159	23	35	0,175	0,016
32,5	-0,29	0,386	35	70	0,350	0,036
33,5	0,43	0,666	62	132	0,660	0,006
34,5	1,14	0,873	44	176	0,880	0,007
35.5	1,99	0.969	18	194	0.970	0.001
36.5	1,96	0.005	6	200	1.01.2000	0.005

Hence the D test statistic: D=0.036 and
Because $\sqrt{n} = \sqrt{200} = 14{,}14$ the empirical value of λ- Kolmogorov statistic is . $\lambda = D\sqrt{n} = 0{,}509$
From the λ- Kolmogorov distribution table we read the critical value for the adopted level of significance 0.05 which amounts to 1.358.
Therefore, there are no grounds for rejecting the hypothesis that the distribution of expenses is a normal distribution.

The Wilcoxon signed-rank test

The Wilcoxon signed-rank test[11] allows to check whether two samples whose results are mutually assigned (i.e. create pairs) come from one population or not. The test is used in situations where we have two measurements (before and after an event) and we want to prove that these measurements are different.

[11]This group includes the sign test and McNemar's test. The book features the Wilcoxon signed-rank test because it is stronger that the two tests above.

In other words, this test is designated to check the significance of differences between two measurements. These two dependent measurements are either two observations of the same object (e.g. before and after an operation) or observations of pairs of objects of the same properties (the so-called equivalent twos).

The null hypothesis says that the results of two measurements are the same. By means of the test, we can ascertain whether samples differ from each other in respect of certain properties. This easy-to-use test requires only an assumption that the values of research variables can be ordered (they are measurable on an ordinal scale) (as for the population distribution, no assumptions are made save its continuity).

The following procedure is used:

- from two research populations an identical number n of elements for two samples, whose results correspond to each other in pairs, is drawn,
- the null hypothesis that both samples come from the same population is set up,
- the difference of results of both samples for all pairs of results is calculated,
- absolute values of these differences are ranked (i.e. they are assigned consecutive numbers beginning with 1 for the smallest difference as regards its absolute value). The established ranks are recorded in both groups, separately for positive and negative differences,
- ranks in both groups are summed up; the sum of ranks T+ for positive differences and the sum of ranks T- for negative differences are obtained,
- the value of statistic T, as the smaller of two sums, is found,
- the value of the calculated statistic is compared with the critical points of the T-Wilcoxon statistical distribution. If $T \leq T_{\alpha}$,, hypothesis H_o is rejected. It means the populations from which samples were taken are different.

Example

The following table presents the results of the test in knowing commercial law for a randomly chosen group of sellers from a certain well-known retail chain before and after training.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of points BEFORE	73	68	75	54	53	84	84	86	66	84	78	58	91	57	59	88	71	84	64	85
Numbe r of	88	69	86	59	57	82	94	93	64	91	86	59	91	60	57	92	70	88	70	85

points AFTER																		

On the basis of the results obtained by twenty sellers, verify the hypothesis that a course in commercial law does not improve the level of knowing it.
We want to check whether the obtained results contradict the hypothesis that a training course does not increase the level of competence in commercial law.
Since our data comprises two observations in the same person, we will use a non-parametric test for associated variables in order to verify the hypothesis. Here, a signed-rank test.
A pair of hypotheses:
H_0: Training does not improve knowledge of commercial law
H_1: Training improves knowledge of commercial law

Below are ranks for particular differences.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of points BEFORE	73	68	75	54	53	84	84	86	66	84	78	58	91	57	59	88	71	84	64	85
Number of points AFTER	88	69	86	59	57	82	94	93	64	91	86	59	91	60	57	92	70	88	70	85
Difference	15	1	11	5	4	-2	10	7	-2	7	8	1	0	3	-2	4	-1	4	6	0
Ranks	20	4	18	12	10	7	17	14,5	7	14,5	16	4	1,5	8	7	10	4	10	13	1,5
Ranks+	20	4	18	12	10		17	15		15	16	4	1,5	8		10		10	13	1,5
Ranks-						7			7						7		4			

Sum of ranks with positive signs: T+ = 174
Sum of ranks with negative signs: T- = 25
Test verification: T=min{T+; T-}=25
Critical points of T-Wilcoxon distribution for α=0,05 is equal to: Tα=52.
Hence test verification T=25 is less than Tα, so we reject the hypothesis that training does not improve knowledge of commercial law.

20.11. Prognostic methods

Decisions made on the basis of research results concern, among other things, formulating prognoses that relate to company managerial activity: operational, tactical and strategic. Prognosing refers to the future, so it is important to make every effort to make a correct assessment of the ever-changing market mechanisms. It needs to be remembered that this process is essential not only for sales but also for managing a whole company. If we make a correct prognosis of demand, we will be able to produce, supply and sell products/services in the

volume that is really required. A company's priority, therefore, should be to make a regular prognosis of the market, securing, at the same time, the right quantitative level of services and products.

Three groups can be distinguished among prognostic methods : intuitive, research, project, recursive.

Depending on the degree of exactness and use of results in the future (in the area of sales forecasting), the following can be distinguished:

- projection,
- prediction,
- sales forecasts.

A sales projection concerns transferring past and present conditions into the future. It is carried out on the basis of a recognized developmental tendency through extrapolation. A sales prediction is based on dependencies between sales and factors which affect it. A sales forecast is most often developed on the basis of projection and prediction with regard to non-measurable factors which were not found in statistical models.

Prognostic methods are shown in illustration 20.8.

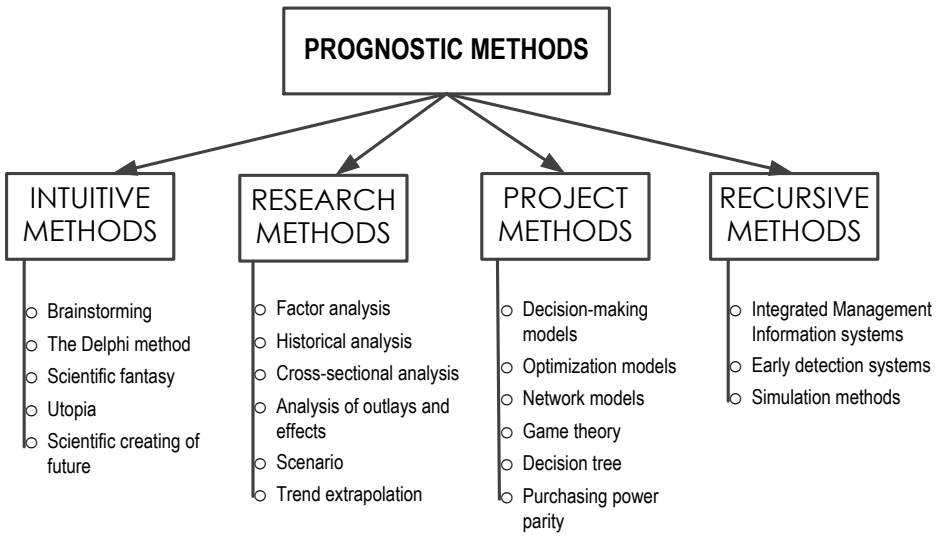

Illustration 20.8. Prognostic methods. Source: own elaboration based on work (Mynarski p. 235)

20.12. Summary

Meeting an aim and solving research problems is carried out through the verifications of hypotheses, through looking for dependencies and correlations and through the application of tools used in descriptive and mathematical statistics[12]. Using statistical tools increases the credibility of measurements and allows to make decisions based on them with a higher degree of certainty.

Control questions

1. Discuss what an analytical process consists in
2. Classify analytical procedures
3. Discuss one-way procedures
4. Discuss two-way procedures
5. Discuss multi-way procedures
6. Discuss statistical tools used in data analysis
7. Enumerate and discuss statistical measures
8. Discuss the usefulness of the arithmetic mean and median
9. Discuss the application for centiles (percentiles)
10. Discuss the Gaussian distribution
11. Discuss Student's t-distribution
12. Discuss the chi-squared distribution
13. Discuss the application of the chi-squared test
14. Discuss the application of the Kolmogorov test.
15. Discuss the application of the signed-rank test.
16. Discuss prognostic methods

[12]Detailed information in: Chakrapani C. (2009), Statistics in Market Research, Willey; Mazzocchi M. (2008), Statistics for Marketing and Consumer Research, Sage Publications.

21. METHODS OF INTERPRETING AND PRESENTING DATA

21.1. Introduction

The last stage of a research process is the interpretation of research results implemented bearing in mind the economic and market context of a company. Results can be interpreted through:

- deduction, which should be understood as a procedure in which conclusions logically result from premises,
- induction, which is a general procedure where premises follow from a conclusion drawn,
- analogy, which consists in transferring statements concerning one phenomenon onto others on the basis of their mutual similarities,
- experiment, in which changes are observed. These changes take place in a research phenomenon or process as a result of interfering in the system of factors which shape this process or phenomenon,

- analysis, which consists in breaking up a process (phenomenon, features) into given elements and studying the influence of particular elements on the entire process,
- synthesis, which is connected with the introduction of statements, beginning with detailed and ending with the general ones.

For the process of interpretation to run correctly, it is important to possess facts obtained from accurate and reliable measurements.

21.2. Report

The results of marketing research, even though being processed and analyzed in the best possible way, are useless before they are forwarded to people who make decisions based on them. Therefore, it is very important to present and transfer conclusions in a way that makes them interesting, relevant and easy to make decisions. The presentation of research results is the last stage of each marketing research. At the same time, it belongs to the most important stages from the point of view of their usefulness in a decision-making process. The entire process of marketing research should be summarized in a written report supported with an oral presentation. The procedure of preparing a report is shown in illustration 21.1.

Each well drawn-up report of marketing research should contain the following:

- A preliminary summary containing major results, general conclusions and basic recommendations.
- An introduction containing fundamental notions, a research aim, research problems, assumptions and research hypotheses and a range of research being carried out.
- A research design containing a list of necessary information, methods in which data is to be collected, a description of research population, characteristics of a research unit, sample size, reasons for choosing a given research method, construction of an instrument, scaling methods, a measurement timetable and a measurement procedure.
- A data analysis covering research methodology, the course of hypothesis verification, reasons for choosing statistical tools.
- Research results.
- Detailed conclusions and recommendations.

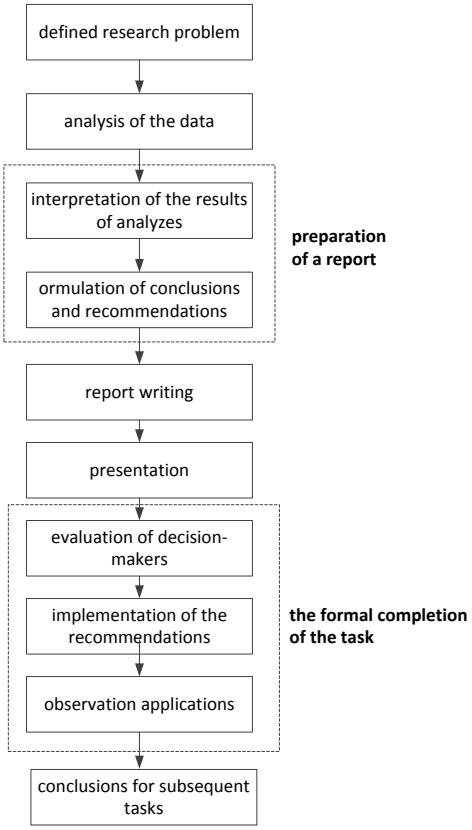

Illustration 21.1. The procedure of preparing a report (own work)

Elaborations prepared on the basis of research data should contain all elements necessary to interpret data in an unambiguous way.

21.3. Graphic presentation of results

Visualization consists in presenting a set of data in a graphic form. Visualization can be performed in order to:

- facilitate searching for data in large sets,
- capture information about the distribution of an analyzed feature,
- compare sets with respect to a specific set of features,
- capture information about various relations between features.

Graphic presentations of research data should take into account some specific

principles. In particular:

- graphic presentations should be in the form of graphs, which is understood as scaling height/surface proportionally to data obtained through research,
- if graphs are not scaled beginning at 0 (zero), they must contain a numerical or percentage description of the scale used and the value of a variable which is represented by the graph,
- while presenting many graphs next to each other, it is important to make sure that particular scales are precisely assigned and adequately described for particular graphs.

Pie chart

A pie chart is a simple way to present data, whose sum gives a certain whole. A chart may present a numerical representation of values of a particular feature or its percentage share in the whole. The size of each section is proportional to an appropriate value of a feature. Values should be larger than 0. It is important to remember that negative values cannot be presented on a chart. This type of chart interprets data in the following way: one case is one section. Such charts are often used in budget reporting, financial and analytical reports, etc. The illustration shows the Family Business sector with respect to specific features (here abstract features).

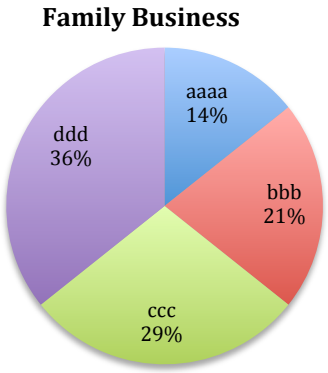

Illustration 21.2. A pie chart of behavioural patterns of family businesses (own work)

Linear graphs

A linear graph is one of the most popular statistical graphs. Data is presented by means of lines, most often broken lines. Each point is connected with a line from the first to the last value. This form of graph is most often used to present data collected within a given period of time. Most often a fixed unit of time is adopted for the x-axis and a chosen variable for the y-axis. Thanks to this form of data presentation, the variability of a given variable can be shown, e.g. in time.

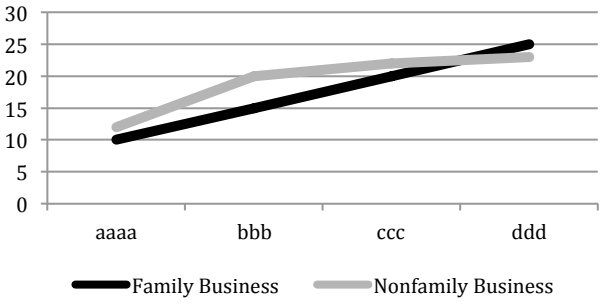

Illustration 21.3. Data linear graph (own work)

Linear graphs allow to quickly recognize and analyze a tendency of a given variable with respect to time. A linear graph is the most frequently used graph in economic and stock exchange analyses. The main advantage of such a graph is the intuitive form of data presentation with respect to the analyzed periods of time.

Column graphs

A column graph is most often used to present a level of a given variable for a few analyzed groups. It is used for the graphic presentation of differences between groups as regards a particular feature. The analyzed feature is expressed as a number on the graph. Columns may present average levels of a given feature of research groups as well as a number of observations. Column graphs are used to compare groups in a graphic way. By means of this form, we can present the scale of differences between the analyzed groups. A more sophisticated form of a column graph is presented below.

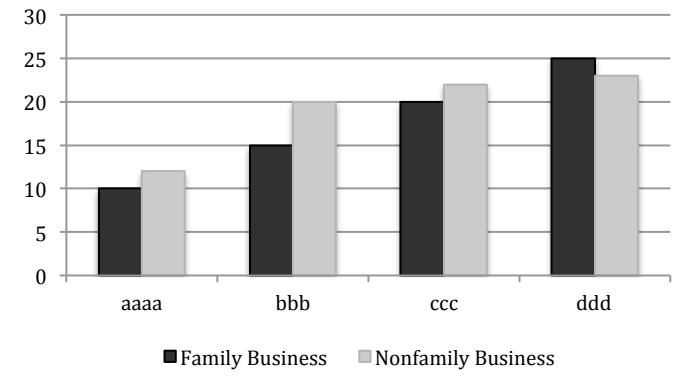

Illustration 21.4. Data column graph (own work)

Bar graphs

A bar graph is most often used in the case of presenting the frequency of answers of repeated character or if there are many possible answers available. Through the application of a bar graph, a researcher usually wants to order answers in a given sequence (from the most frequent to the least frequent or the other way round). Such presentation of data makes it possible to observe which answers were given the most often and which ones the least often.

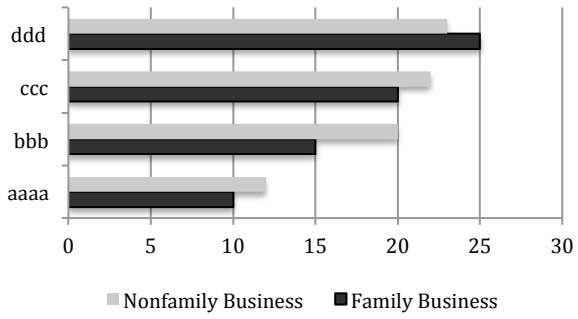

Illustration 21.5. Data bar graph (own work)

Scatter graphs

The so-called scatter graph is a graphic interpretation of correlations. One of such graphs is presented below. The graph has been developed as a two-dimensional plane where one axis corresponds to the results of one variable and the second axis to the results of the other variable. When analyzing correlations – relationships between two variables –, particular persons are analyzed through the lens of two variables. The points on the graph correspond to particular cases/persons being investigated. Each of the persons investigated is assigned a result for a variable on the x-axis and on the y-axis. It needs to be noted that the scale of the axes does not begin at 0 does not tend to +/- infinity. This kind of graph is not to be confused with the coordinate axis. The scale in a scatter graph always reflects the scale for a given variable. These graphs are to reflect mutual relationships between two variables – correlations. Usually, the justified use of correlations is limited to variables measured in a quantitative scale. If we had two variables of 0-1 character (nominal, dichotomous), we would receive 4 points on a graph, which would not have any sense in the interpretation of any relationship.

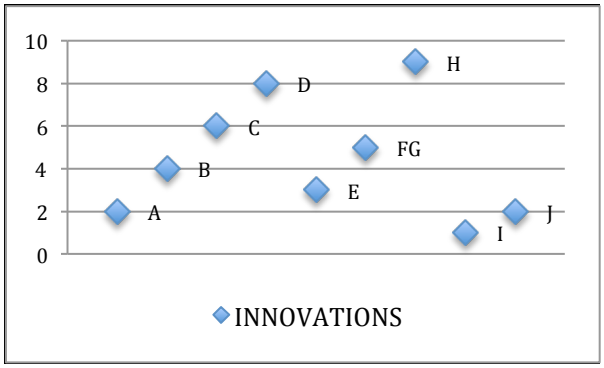

Illustration 21.6. Data scatter graph (own work)

Radar graphs

A radar graph is a good way to display one or more variables on a two-dimensional graph where each arm represents a different variable. A line connects all data points from a spreadsheet along each arm beginning in the centre of the graph and ending on the outside circle. The illustration shows the number of modifications introduced in family and non-family businesses over the period of

12 months.

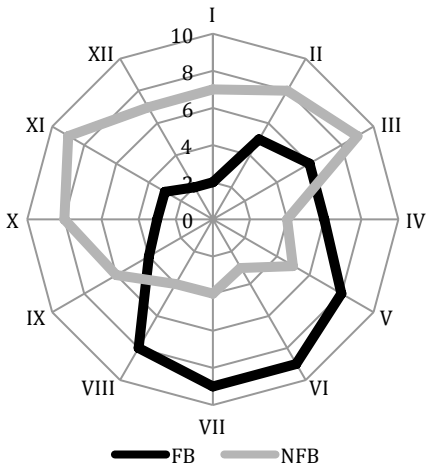

Illustration 21.7. Radar graph (own work)

Box plot

A box plot is used to display a central tendency, variability and assymetry of feature distribution. It also allows to detect untypical observations. Illustration 1.5 shows the elements of the box-and-whisker plot. The central line inside the box is a median (or arithmetic mean), the sides of the box (left and right) correspond to the first and third quartile and the distance between them (the so-called interquartile range IQR) is represented by the length of the box. The so-called inliers (marked with dots in the illustration) are specified as points lying in the distance of 1.5 times of the IQR from the sides. Often a plot is marked with the so-called outliers which are represented by points lying in the distance of three times of the IQR from the side.

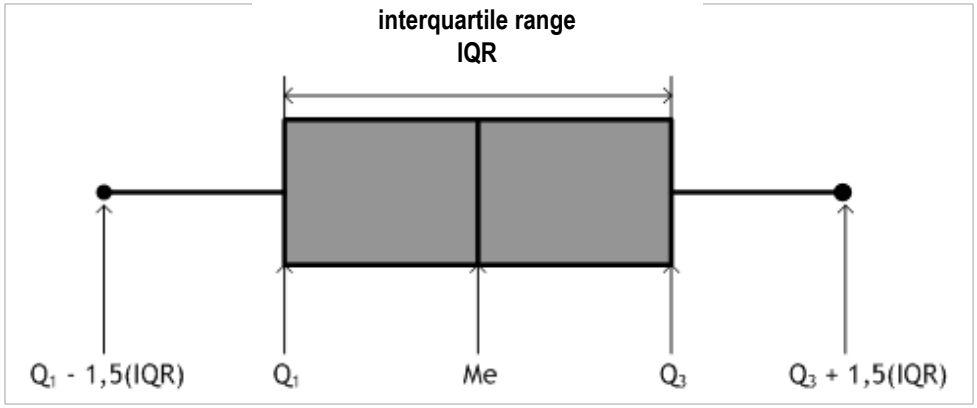

Illustration 21.8. Elements of the box-and-whisker plot

Box-and-whisker plots allow:

- to locate a set of data around a median (1.6),
- to identify scattering of data (illustration 1.7),
- specify the skewness of a set (illustration 1.6),
- detect results suspected of being untypical (illustration 1.8),
- compare two or more sets (illustrations below).

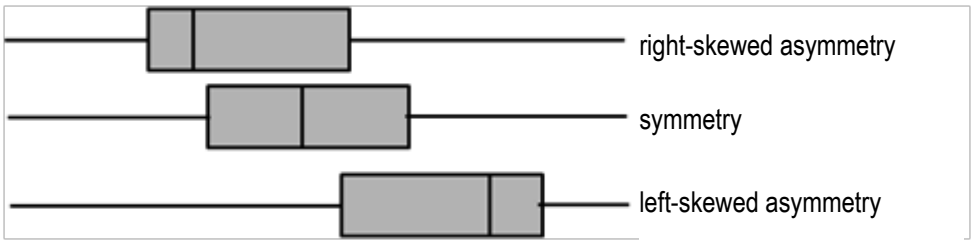

Illustration 21.9. Box-and-whisker plots for sets of various types of asymmetry

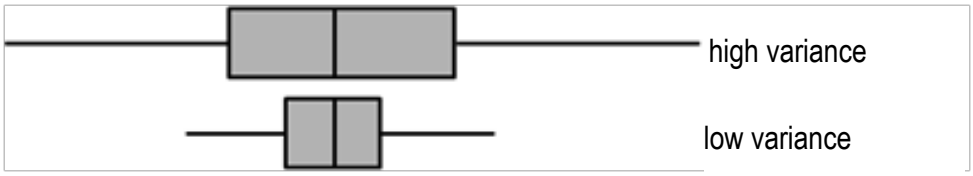

Illustration 21.10. A box plot for two sets of low and high variance

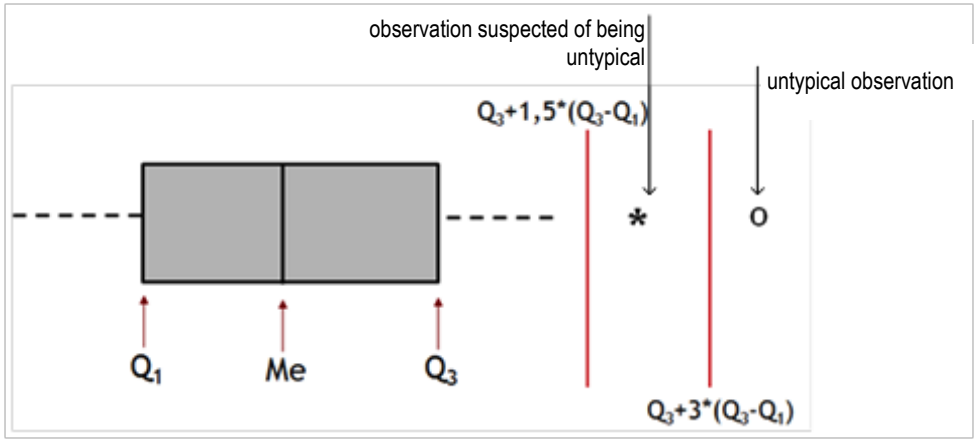

Illustration 21.11. Graphic interpretation of detecting untypical observations

21.4. Summary

Presentation dots the 'i's and crosses the 't's of the whole research process. The quality of decisions made by parties commisioning research depends on the form and contents of a report and the presentation of results. The analysis of available reports and presentations of the results of marketing and scientific research allows to formulate the following postulates:

- usually both written and oral methods of presenting research data are used,
- the form of data presentation should be clear, interesting and relevant to the subject,

- a good report focuses on a decision and supports making it,
- methodical details should be avoided as this is something decision makers are not usually interested in; they need to be collected, however, in case doubts emerge and need to addressed,
- terminology should be adapted to the vocabulary stock of recipients – no unnecessary technical terms should be introduced; if it is necessary such terms should clarified,
- a report should be written in an easy-to-follow language so that it is interesting for a recipient,
- using graphic methods of data presentation makes a report clear and easy to read and understand,
- one should observe a principle of a sentence containing not more than 2 or 3 numerical data.

Recently gained popularity infographics. The compact presentation of research results submits popularization of applications. Examples of infographics are presented in Appendices 1-3.

Control questions

1. What types of logical thinking are used in the interpretation of research results?
2. What should a well-prepared report of marketing research contain?
3. What is facilitated by the graphic presentation of results?
4. What forms of graphs do you know?
5. Discuss the use of graphs.

22. QUESTIONNAIRE EXAMPLES

This chapter features a selection of interview questionnaires and surveys used in both marketing and sociological research. The purpose of presenting selected questionnaires is to make readers aware of how diverse a questionnaire can be in respect of its aim, form, choice of questions and scaling of answers.

22.1. Evaluation questionnaire

A&E — Workshop evaluation

Thank you for attending the workshop organized by the A&E company. We would very much appreciate your willingness to fill out this short questionnaire, which will help us improve our workshops in the future. YOUR ANSWERS WILL REMAIN ANONYMOUS UNLESS YOU DECIDE OTHERWISE.

– What workshops did you take part in? (please mark)

- Introduction to marketing research
- Customer satisfaction survey
- Research design

2. How did you find out about the workshops?

_____

_____

3. Please evaluate the following issues on a scale from 1 to 5, where 1 means "very dissatisifed", and 5 "very satisfied".

	Very dissatisfied				**Very satisfied**
Speakers	1	2	3	4	5
Substantive content	1	2	3	4	5
Detailed character of content	1	2	3	4	5

Information obtained prior to workshop	1	2	3	4	5
Supplied materials	1	2	3	4	5
Venue	1	2	3	4	5
Meal	1	2	3	4	5

4. We will be grateful for any additional comments about the above issues.

_____

_____

5. Which workshops did you like most?

_____

_____

6. Which piece of information obtained during the workshops did you find the most useful?

_____

_____

7. What elements of knowledge acquired here will you practically use?

_____

_____

8. To what extent did the subject of the workshop correspond to your professional work? (please mark one answer):

- Was very similar - Go to question 10.
- Was fairly similar - Go to question 10.
- It is hard to say - Go to question 9.
- Not very similar - Go to question 9.
- Was entirely different - Go to question 9.

9. Try to justify your opinion.

_____

_____

10. How interesting were the workshops for you? (please mark one answer):

- Very interesting - Go to question 12.
- Fairly interesting - Go to question 12.
- It is hard to say - Go to question 11.
- Not very interesting - Go to question 11.
- Entirely uninteresting - Go to question 11.

11. Try to justify your opinion.

_____

_____

12. How do you assess the quantitative ratio of theoretical and practical issues presented during the workshops?

_____
_____

13. How would you generally assess the day spent with us, with 1 meaning "I am very dissatisfied" and 5 "I am very satisfied"?

1 2 3 4 5

14. Try to justify your opinion.

_____
_____

15. Would you like to add something else?

_____
_____

Thank you for filling out this short survey. Information about the person who gave this data would be very useful for us. If you, however, wish to remain anonymous, we respect your decision. It does not mean we are not interested in your opinion. Therefore, leave the following fields blank and click the button "send the survey".

22.2. Servqual questionnaire

SERVQUAL evaluation of the level of satisfaction with using a sports venue

The following questionnaire has been created in order to evaluate the level of satisfaction with using a sports venue...
Please fill out the following questionnaire with your expectations evaluated on a scale from 1 to 5 and your real impressions from using the services.
Please express your impressions in the form of a grade, where 1 means a very bad grade and 5 a very good grade. Please evaluate in two parts – expectations and reality. Each question requires two evaluating grades.

Using the services		**Evaluate your expectations**					**Evaluate reality**				
		1	2	3	4	5	1	2	3	4	5
TANGIBLE ELEMENTS	Attractiveness of information boards on the premises										
	Modern equipment										
	Complex equipment										
	Easy access to the premises										
	Clean premises										
RELIABILITY	Technical condition of sports equipment										
	Quality of sports equipment										
SPEED OF REACTION	Training staff assistance										
	Available training programmes										
	Adjusting training programme to clients' possibilities										
ASSURANCE	Safety on the premises										
	Premises signage										
	Availability of the premises rules and regulations										
	Measurement of progress in training										
EMPATHY OF	Staff										

	Gym trainers										
	Group exercise trainers										
	Masseurs										

Splitting 100 points between the following categories, evaluate the significance of the categories by writing a number of points into the table (the more points assigned from the pool of 100, the more significant the category is for you)

Tangible elements	**Reliability**	**Speed of reaction**	**Assurance**	**Empathy**

Thank you for filling out the survey!

22.3. Questionnaire of self-presentation styles

Questionnaire of Self-presentation Styles[13]

We are interested to know how often people behave in different ways in contacts with other people. We would appreciate it if you could state how often you behave in each of the below described ways. The research is anonymous and serves to meet scientific aims.

With each way of behaving, please mark (circle) a number signifying how often you tend to behave in a given way in contacts with other people.

The higher the number, the more frequent a given way of behaving is, according to the principle:

1 – never 2 – rarely 3 – sometimes 4 – often 5 – very often

1 2 3 4 5	1. I depreciate the significance of my achievements.
1 2 3 4 5	2. I give the impression that I know more than is really the case.
1 2 3 4 5	3. I stress my achievements.
1 2 3 4 5	4. I give the impression of a person preoccupied with serious issues.
1 2 3 4 5	5. I perform worse than another person so that this person does not feel sad.
1 2 3 4 5	6. I give the impression of lacking self-confidence.
1 2 3 4 5	7. I undertake to perform certain tasks in order to show that I can do something.
1 2 3 4 5	8. I stress my skills.
1 2 3 4 5	9. I avoid talking about my successes.

13Author: Bogdan Wojciszke

1 2 3 4 5	10. When I am worrying that I will underachieve, I talk about it with others.
1 2 3 4 5	11. I try to portray myself as being knowledgeable.
1 2 3 4 5	12. I say sorry even if it is not my fault.
1 2 3 4 5	13. I stress my vices.
1 2 3 4 5	14. I talk about what I managed to do.
1 2 3 4 5	15. I give the impression of being self-confident.
1 2 3 4 5	16. I try not give myself airs and graces.
1 2 3 4 5	17. When I do something well, I also try to show my weak points.
1 2 3 4 5	18. I acknowledge my helplessness.
1 2 3 4 5	19. I talk about my virtues.
1 2 3 4 5	20. Even if I cannot do something, I behave as if I could.
1 2 3 4 5	21. I give the impression of being competent.
1 2 3 4 5	22. I behave more helplessly that I feel.
1 2 3 4 5	23. I talk to others about what I failed to do.
1 2 3 4 5	24. I put a good face on a bad game when things are going awry.
1 2 3 4 5	25. I say in advance that I will not manage to do something.
1 2 3 4 5	26. I avoid performing very well.
1 2 3 4 5	27. When I have no knowledge of something, I hide it.
1 2 3 4 5	28. I speak in a confident manner even if I am not sure.
1 2 3 4 5	29. When I do something well, I convince others that it was a coincidence.
1 2 3 4 5	30. In discussions, I like to show that I know the ropes.

Thanking you for taking part in the survey, we would like to ask you for your:

age ..... and sex ..... .

22.4. Summary

Knowing the rules of constructing interview questionnaires and surveys seems to be a basic skill used by everyone in their professional work, no matter what position they fill or what kind of business they are in.

Developing a good questionnaire comes with time. The practice of developing, scaling and sequencing questions will eventually make everyone create their own techniques of constructing such tools, which will in turn be perfected drawing upon recent advances in technology and computer science.

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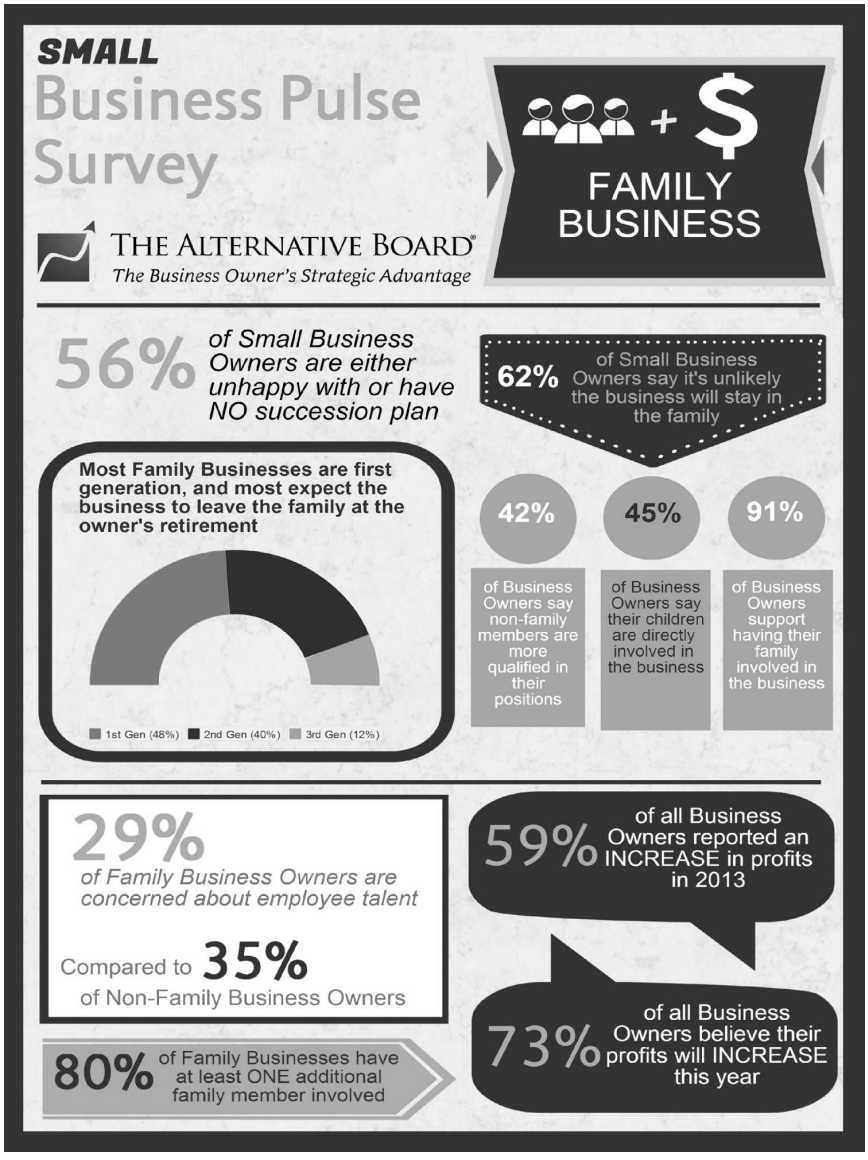
ATTACHMENTS

ANNEX 1

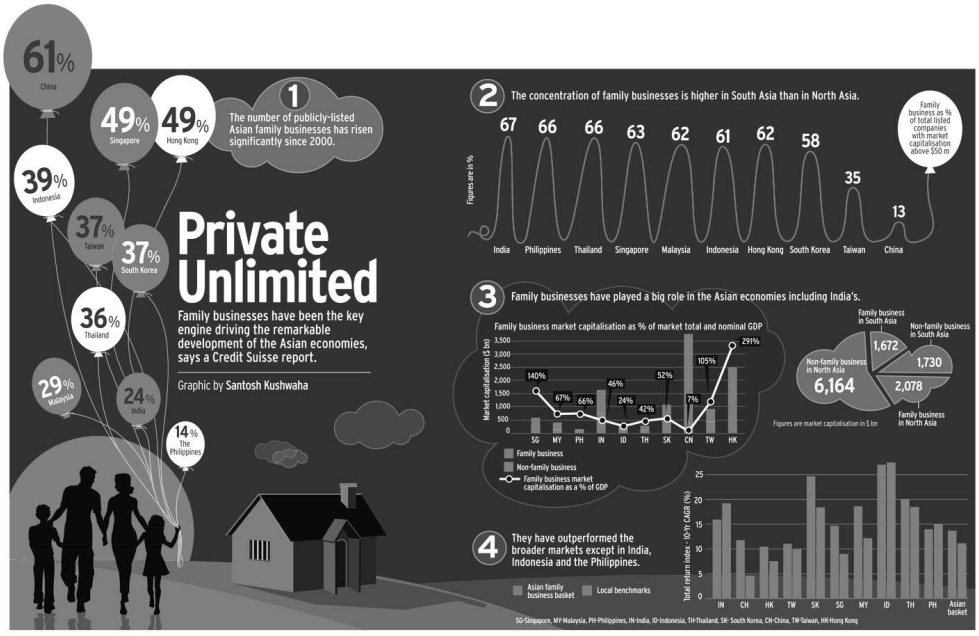
Infographic: Small Business Pulse Survey

Source: http://www.veooz.com/photos/MHGzISz.html



ANNEX 2

Infographic: Family Business i Asia
Source: http://santosh-kushwaha.blogspot.com/2011/11/infographic-on-family-business.html



ANNEX 3

Infographic: What keeps Belgian Family business owners up at night
Source: http://www.pwc.be/en/publications/2013/family-business-survey.jhtml