

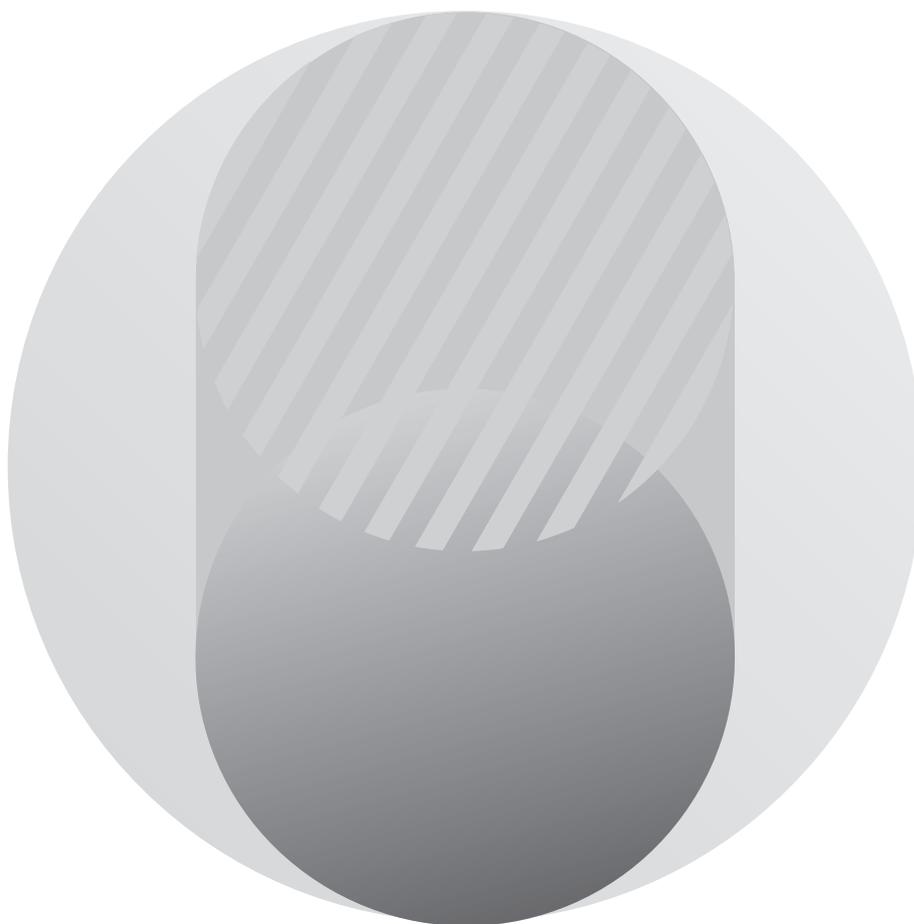


Zeszyt metodologiczny
Wskaźniki społeczeństwa informacyjnego
Badania wykorzystania technologii informacyjno-komunikacyjnych

Methodological report

Information society indicators

Surveys on the use of information and communication technologies



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Surveys on the use of information and communication technologies

Główny Urząd Statystyczny Statistics Poland

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Preface

New information and communication technologies (ICT) are one of the key factors changing the world. Their continuous development and ubiquitous availability of digital products constitute a priority supporting the economic and social development of the state.

Information has become one of the main production factors as a result of continuous development of technology. On the one hand progress contributes to generate increasing information resources, but on the other hand the development of these resources is becoming a condition for creating new technologies, products, solutions.

The following publication aims at presenting the methodology of the survey on *Information society indicators* conducted annually according to the Programme of Statistical Surveys of Official Statistics. The methodological report, prepared by employees of the Centre for Science, Technology, Innovation and Information Society Statistics at the Statistical Office in Szczecin, includes information on the subjective and objective scope of the survey, used tools, survey organisation and forms of disseminating results.

Handing over the following publication we would be grateful for any suggestion regarding its content and scope of conducted statistical surveys. Your comments will be a valuable source of information for us.

Director
of the Statistical Office in Szczecin



Magdalena Wegner

Szczecin, February 2022

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Symbols and major abbreviations

Symbol	Description
BJS	Base of Statistical Units
CAWI/CAII	Computer Assisted Web/Internet Interview
CAPI	Computer Assisted Personal Interviewing
CV	coefficient of variation
DG-1	Report on economic activity
EUROSTAT	Statistical Office of the European Union
F-01/I-01	Report on revenues, costs, financial result and expenditures on fixed assets
GUS	Statistics Poland
ICT	information and communication technologies
NACE	classification of economic activities in the European Union fr. Nomenclature Statistique des Activités économiques dans la Communauté Européenne
NUTS	Classification of Territorial Units for Statistical Purposes fr. Nomenclature des Unités Territoriales Statistiques
PBSSP	statistical survey program of official statistics
PKD	Polish classification of economic activity
SE	standard error
SIB	IT system of the survey
SP	Yearly enterprises survey
EU	European Union
EC	European Community

Introduction

Information on indicators related to the usage of information and communication technologies in public administration units is collected within the survey on Information society indicators (1.43.14) included in the Programme of Statistical Surveys of Official Statistics.

Information and communication technologies (ICT) are crucial in creating new sources of income and employment. Therefore, they also have a significant economic importance and their impact reaches far beyond the economic sphere. This is because ICT are general purpose technologies that cut across all aspects of social and economic life. Companies are changing their internal organisation to use them effectively. Public administration is adjusting ways of interaction with citizens and businesses. New means of communication are creating new behaviour patterns and customer behaviour is changing. This issue constitutes one of the Polish and European development policy pillars.

The survey on usage of communication and information technologies aims at monitoring the level of access and usage of information and communication technologies in public administration units, enterprises, households and by individuals.

The publication contains three chapters and an annex. The first chapter concerns characteristics of the survey on usage of ICT in households and by individuals. The second chapter presents methodology of the survey on usage of ICT in enterprises belonging to both financial and non-financial sector. The third chapter includes issues concerning the survey on usage of ICT in public administration units – the government (state) administration, including central offices, and local self-government administration.

The surveys concerning usage of information and communication technologies in enterprises and households are conducted on the basis of the model questionnaires developed by statistical offices of the EU Member States and the Statistical Office of European Union (Eurostat). Since 2006 the survey has been based on Regulation No 808/2004 concerning Community statistics on the information society. Commission implementing regulations, which describe in detail topics surveyed in the following reference year, are issued annually on the basis of Framework Regulation. The basis for conducting the survey on Information Society Indicators in Poland is the Act of 29 June 1995 on Official Statistics (Journal of Laws of 2018, item 997, as amended) and the annual regulations of the Council of Ministers concerning the Programme of Statistical Surveys of Official Statistics establishing the survey programme for a given year.

1. Survey on ICT usage in public administration

In 2015 Statistics Poland conducted for the first time within research work the survey *ICT usage in public administration in 2014*. It enabled obtaining information on availability of e-services, their level of maturity and level of use by citizens and enterprises as well as level of computerization of public administration. The survey covered all commune, country, voivodship and marshal offices. In 2016 another edition of the survey was conducted as part of official duties supported by the letter of intent concerning co-operation between the Ministry of Regional Development and the President of Statistics Poland. The survey also covered government administration, including central offices. In comparison with the previous edition, the objective scope was significantly reduced while keeping strategic information. In 2017 preparatory works started for the survey which was conducted in 2018 within the research work *Acquiring indicators on e-administration to support the system of programming and monitoring cohesion policy in the financial perspective 2014-2020*. The survey covered the years 2016 and 2017, and its objective scope was significantly increased. Since 2019 data on digitalization of public administration and e-services provided by these units have been collected within the Programme of Statistical Surveys of Official Statistics.

1.1. Subjective and objective scope of the survey

The survey aims at, firstly, gathering information on usage of advanced ICT in public administration as well as ways and degree of use, secondly, gathering data on types and availability of public services provided via the Internet by public administration.

The subjective scope of the survey covers public administration in a breakdown by:

- government (state) administration, including central offices,
- self-government administration in a breakdown by commune, country and marshal offices.

The following criteria are taken into account during selection of units for the survey:

- ownership form: ownership of State Treasury, state legal persons, self-government units or self-government legal persons,
- specific legal form: funds, public administration bodies, state inspection and law enforcement bodies, state organisational units, commune self-government organisational units, county self-government organisational units, voivodship self-government organisational units,
- type of funding: self-financing units that are not budgetary units or self-government budgetary entities and budgetary units,
- type of unit: government and public authorities sector, including: ministries, selected units supervised by ministries, selected units supervised by the Prime Minister and local self-government sector,
- type of conducted activity according to the Polish Classification of Activities (Polish Classification of Activities 2007). The survey covers units that conduct activities classified into section O Public administration and defence; compulsory social security, excluding class 84.21.Z – Foreign affairs.

Data on digitalization of public administration as well as types and level of availability of public services provided via the Internet by public administration are the subject matter of the survey.

1.2. Survey method

Indicators on ICT usage by public administration are collected within an annual, full-scale survey which covers units included in the population on the basis of previously determined features. The statistical population is established on the basis on a unit selection algorithm from Statistical Units Database. Units are selected on the basis of: type of activity, specific legal form, ownership form, financing type, type of unit – marking introduced for statistical purposes. The survey file is created on the basis of units selected from Statistical Units Database and includes the following information: REGON number, type of unit, name, territorial symbol, address, e-mail and telephone number, legal and economic activity, type of conducted activity, size class, number of persons employed, type of financing, ownership form, specific legal form. It also includes answers given by the unit in the previous survey if it fulfilled its statistical obligation for the purpose of correct validation of data collected in the current survey.

1.3. Characteristics of data gathering tools

The survey ICT usage in public administration is conducted via the Reporting Portal, with the use of an electronic questionnaire (Computer Assisted Web Interview method – CAWI), which constitutes a basic tool for collecting data. If a unit does not have an active account on the Reporting Portal, it is possible to fill in and submit a questionnaire in a paper form.

An electronic questionnaire is a representation of a set of data (questionnaires) SSI-03 determined in the Programme of Statistical Surveys of Official Statistics for a given year and contains questions concerning:

- ICT usage,
- availability of public services provided via the Internet,
- expenditures on ICT,
- identification data.

Answers are given on an electronic questionnaire via:

- ticking a correct answer or selecting from a list – a so-called “glossary”,
- providing a numeric value in a box.

1.4. Selected variables from the survey

Due to a dynamic development of ICT and a systematic extension of the scope of electronic services provided by public administration, the scope of questions included in a questionnaire may change while maintaining comparability of data included in national strategies. The questionnaire may include questions which allow obtaining data in accordance with the needs of users reported as remarks to the Programme of Statistical Surveys of Official Statistics. Selected variables are presented below:

Public administration units with broadband and narrowband access to the Internet

This category includes broadband fixed lines (e.g. ADSL, SDSL, VDSL, optic fibre network, cable TV network, public Wi-Fi), broadband mobile lines (e.g. at least 3G) and narrowband mobile lines.

Public administration units whose maximal contracted speed of the fastest fixed Internet connection falls within the following bands:

- Less than 2 Mbit/s,
- At least 2 but less than 10 Mbit/s,
- At least 10 but less than 30 Mbit/s,
- At least 30 but less than 100 Mbit/s,
- At least 100 but less than 500 Mbit/s,
- At least 500 Mbit/s.

Public administration units equipping persons employed with mobile devices enabling mobile connection with the Internet for professional purposes.

Public administration units providing remote access to persons employed to resources, outside their premises.

This category includes remote access to:

- official e-mail,
- official documents in order to modify them,
- data of a unit,
- apps dedicated for a unit.

Public administration units with ISO system.

Public administration units hiring ICT specialists.

Public administration units providing ICT training to persons employed – in a breakdown by for ICT specialists and other persons employed.

Public administration units in which tasks related to ICT were performed by persons employed and/or external entities.

Tasks related to ICT include: maintenance of ICT infrastructure, supporting users of office software, development and maintenance of software, business management systems, Web solutions, ensuring ICT security and data protection. Development and maintenance of software is understood as developing tailor-made, customised software from scratch as well as customisation of purchased, packaged, off-the-shelf software. Sole purchase of standard software in regular sales (without any modification) is not a task related to ICT as well as a standard update of regular antivirus software.

Public administration units using electronic document management system.

Public administration units using numerical maps (digital and available spatial data).

Public administration units having Open Data policy or strategy.

Public administration units providing online data from public registers or other data resources collected in an office.

Public administration units using Business Intelligence tools.

Public administration units using cloud computing solutions.

This category includes the following solutions:

- IaaS,
- PaaS,
- SaaS,
- DaaS (Device, Database),
- other.

Public administration units which have Intranet.

Public administration units whose websites met WCAG 2.0 recommendations (Web Content Accessibility Guidelines) at AA level.

Public administration units whose websites were adapted to mobile phones.

Public administration units whose websites were adapted for foreigners.

Public administration units providing services to citizens via the Internet in the following areas:

Citizenship affairs, public procurement, economic activity, education, tourism, transport, taxes, employment, health and other while determining one of five levels of maturity of services (information, one-way communication, two-way communication, transaction and personalization level) and number of users of these services.

Public administration units enabling electronic submission of Family 500+ application.

Public administration units using an electronic inbox.

This category includes:

- own electronic inbox,
- Electronic Platform of Public Administration Services ePUAP.

Number of documents sent from public administration units (paper and electronic in total), specifying electronic documents, including documents sent with the use of own electronic inbox or Electronic Platform of Public Administration Services ePUAP.

Share of public administration units providing applications which can be downloaded on a mobile device.

Expenditures on ICT incurred by public administration units, including expenditures on:

- IT equipment,
- telecommunications equipment.

1.5. Organisation and management of the survey implementation

The survey on ICT usage in public administration is conducted by the Statistical Office in Szczecin, namely employees of the Centre for Science, Technology, Innovation and Information Society Statistics. A detailed schedule of survey organisation: collecting and processing data, preparing control and result tables, publication of data are included in a survey schedule prepared in co-operation with the Programming and Coordination of Statistical Surveys Department of Statistics Poland.

Tasks of an author team during survey implementation include:

- preparing a survey schedule,
- preparing a questionnaire,
- preparing rules for control of a questionnaire,
- selecting units for survey,
- preparing a survey file in accordance with a determined structure,
- verification of a survey file,
- testing a survey questionnaire on Reporting Portal,
- conducting the survey on Reporting Portal,
- supervision over a survey conduct,
- preparing a survey IT system,
- processing and validating data,
- preparing result tables,
- analysis and acceptance of result tables,
- disseminating data, including compiling data and preparing analyses for publications, updating databases,
- co-operation with public administration units with regard to the survey objective scope.

Survey coordinators co-operate with a team of programmers from the Centre for Data Engineering in the Statistical Office in Szczecin. The Centre supports processing of data collected from respondents and contribute to effective compilation and analysis of results. The tasks of the team include, i.a. developing Survey IT System and creating new functionalities which can streamline everyday work of statisticians and coordinators.

Statisticians, who are employees on the Statistical Office in Szczecin – branch in Stargard, are responsible for direct contact with respondents and collecting data. Their tasks include explaining and correcting mistakes and registering paper questionnaires in Survey IT System as well as monitoring timely submission of questionnaires and sending reminders to entities which did not submit a questionnaire on time. Implementation of the survey requires co-operation with other units of Statistics Poland. Employees of the Statistical IT Centre in Radom also take part in the survey. Their tasks include preparing on-line questionnaire on Reporting Portal, controlling its functionalities and sending notifications to users of the Reporting Portal concerning reporting obligation and its upcoming due date.

1.6. Data presentation

Data on ICT usage in public administration are presented by type of unit, in a breakdown by state administration and local self-government in a breakdown by commune, county and marshal offices. Indicators are presented in accordance with territorial division on a national and voivodship level as well as NUTS2 (regions) level in accordance with NUTS 2016 classification.

Data collected annually concern reporting period from 1 January to 31 December of a survey year. Results of the survey are presented as result tables on a website of Statistics Poland (thematic area – Science and technology, Information society) once a year in May (data for the previous year). A summary of basic results of the survey is presented as news release (in May). A complete analysis of results is presented in the publication Information society in Poland. Results of statistical surveys in the years (...), published in December. Selected information on ICT usage in public administration is also presented on the website of Statistics Poland in Strateg database.

Meeting users' needs: state and local self-government administration, academia, media, citizens and organisations monitoring implementation of public tasks.

Selected links to websites with data and information concerning ICT usage in public administration presented as a publication or a database:

Publication Information society in Poland. Results of statistical surveys in the years (...): <https://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/spoleczenstwo-informacyjne/spoleczenstwo-informacyjne-w-polsce-w-2020-roku,1,14.html>

Tables: <https://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/spoleczenstwo-informacyjne/wykorzystanie-technologie-informacyjno-komunikacyjnych-w-jednostkach-administracji-publicznej-przedsiębiorstwach-i-gospodarstwach-domowych-w-2021-roku,3,20.html>

Strateg: <https://strateg.stat.gov.pl/>

1.7. Survey evaluation – preliminary assessment of the survey quality and data reliability

Data on ICT usage in public administration have very high completeness (almost 100%). Portal application with implemented validation rules ensures logical and arithmetic control of data. Quality and accuracy of data is checked after works in the Reporting Portal are finished with the use of Survey IT System. It includes the function of searching, filtering and generating reports, which enable analysis of completeness and consistency of a dataset, detecting cases differing from correct situation. Tables with results are subject to detailed analysis in order to verify correctness of data.

2. Survey on ICT usage in households and by individuals

The act of 29 June 1995 on official statistics and the annual regulations of the Council of Ministers concerning the programme of statistical surveys of official statistics, establishing the survey programme for a given year, constitute the legal basis for conducting the survey on ICT usage in households and by individuals.

The survey on ICT usage in households and by individuals was introduced to the programme of statistical surveys of official statistics in 2004, initially as a pilot survey included in the Household Budget Survey and since 2005 as a stand-alone annual survey.

The survey on ICT usage in households and by individuals began in the EU in 2002. It covered in all Member States about 120 000 households and 200 000 individuals usually using direct interview or telephone interview. Since 2006 the surveys on ICT usage in all EU Member States have been conducted on the basis of Regulation No 808/2004 concerning Community statistics on the information society which create a uniform system of international statistics in this field in order to enable comparison of ICT indicators.

2.1. Subjective and objective scope of survey

Subjective scope

Households in collective accommodation establishments (boarding house, workers' hostels, pensioners' houses and monasteries, etc.) are excluded from the survey, except for households of workers living in those establishments on account of employee services (e.g. manager of a hotel, janitor). Households of foreign citizens living in Poland permanently or for prolonged period and using Polish language take part in the survey. All persons aged 16-74 are surveyed in every household.

Household – is a group of related or non-related persons, sharing common residence and sharing household expenses or daily needs (a multiperson household) or a person making a living on his/her own, regardless of living with other persons or alone (a one-person household). Family members living together but making a living separately are different households. A size of household is determined by the number of persons making up its composition.

A household composition includes:

- persons living together in a household and making a living together, living or intending to live in a household for at least one year,
- persons absent from the household on account of work if income from such work is transferred to the family to make a living,
- persons absent from the household aged up to 15 years, learning away from the place of residence, living in boarding houses, dormitories or private houses,
- persons absent from the household during the surveyed period, staying in education and care facilities, care centres or hospitals if an actual or intended stay away from the household is shorter than a year.

A household composition excludes:

- persons absent from the household aged over 15 years, learning away from place of residence, living in boarding houses, dormitories or private houses,
- persons staying in prisons,
- persons absent from the household during the surveyed period, staying in education and care facilities, care centres or hospitals if an actual or intended stay away from the household is longer than a year,
- persons staying in the household during the surveyed period (a guest), present in the household or intending to stay for a period shorter than a year,
- tenants, including pupils and students at lodging (except for when they are treated by a surveyed household as members),
- persons renting out a room or bed for the period of work in a given locality (it concerns such works as meliorations, parcel measurements, logging, construction),
- persons living together with the household, employed by this household, e.g. home help, agriculture workers, pupils and apprentices).

Objective scope

The objective of the survey is ICT usage in households and by individuals.

Questions in Polish questionnaires are prepared on the basis of a model questionnaire developed by Eurostat. A model questionnaire is prepared in collaboration of Eurostat with Member States. The structure of a questionnaire is prepared on the basis of jointly defined questions and answers during meetings of working groups and task forces attended by coordinators of national surveys (Poland is represented by employees of the Statistical Office in Szczecin). Representatives of European Commission and OECD who suggest new issues to be included in the survey also take part in meetings.

Polish questionnaire for households (compliant with a model questionnaire) includes questions concerning:

- access of household to the Internet,
- types of Internet connections (information about broadband access and a breakdown by fixed and mobile connections),
- reasons for not having access to the Internet at home.

Polish questionnaire for individuals (compliant with a model questionnaire) includes questions concerning:

- use of the Internet (when last use? how often?),
- use of the Internet via mobile devices,
- purposes of using the Internet (in a breakdown by: communication, access to information, civil and political participation, professional life, creativity, use of entertainment),
- use of cloud computing, websites or apps to arrange accommodation and transport service,
- use of e-government (purposes of using, reasons for not submitting forms),
- use of e-commerce (when last purchase? types of bought or ordered goods or services, downloading or accessing products from websites or apps, country of seller, amount spent on purchases, encountered problems, carried out financial activities),
- E-skills,
- Internet of things.

Apart from a basic set of questions, each year Eurostat adds modules enabling a detailed survey of selected aspect of the information society. Moreover, Polish questionnaires include questions for domestic use concerning:

- reasons for not using the Internet,
- place of using the Internet,
- ICT expenditures of households (in a breakdown by IT equipment and software).

An annex (table 1 and 2) includes an objective scope of household survey since 2005.

Recipients of data from the survey ICT usage in households and by individuals include entities interested in monitoring the development of the information society, especially the Ministry of Digitalisation, the Ministry of Internal Affairs and Administration, the Ministry of Investment and Development, local self-government units, voivodship offices, ICT enterprises, academia, media, citizens and organisations monitoring implementation of public tasks.

Examples of using indicators concerning ICT usage in households in strategies, documents, etc. can be found in: the National Development Strategy, the Strategy for Social and Economic Development of Eastern Poland, the National Strategy of Regional Development 2010-2020, Strategy 'Europe 2020', the European Digital Agenda, the National Broadband Plan.

2.2. Survey method

Survey method

ICT usage in household is a representative survey conducted via a direct interview (by an interviewer) or via an on-line questionnaire. When the survey begins respondents have an opportunity to fill in a questionnaire by themselves on a dedicated website. If they don't fill in a questionnaire or fill it in with mistakes, interviewers will visit them and conduct a direct interview. Participation in the survey is voluntary. The household survey is conducted in April and May every year. The first pilot study conducted in July 2004 was an exception. A few reference periods depending on the type of collected information are used in the survey. Gathered data concern the last 3 months (this period should cover the first quarter of the year to ensure international comparability), the last 12 months and situation on a given date.

Sampling

Two stage sampling with stratification at the first stage is used in the survey. Firstly, primary sampling units are drawn, then – dwellings.

PRIMARY SAMPLING UNITS are selected on the basis of Census Enumeration Areas. In urban areas primary sampling units encompass at least 250 dwellings, in rural areas – as least 150.

STRATIFICATION means division of the surveyed population into categories called strata to increase effectiveness of a sampling scheme – it allows obtaining results with smaller sampling errors.

Primary sampling units are divided into 206 strata taking into account division into subregions and size classes of localities. In the biggest cities a few strata were created by joining neighbouring districts. Big cities usually constituted strata alone. In the case of smaller cities and rural areas, groups of cities of similar size and rural areas belonging to one subregion constituted strata.

Primary sampling units are selected to sample according to the following rules:

- the number of primary sampling units from a given stratum is approximately proportionate to the number of Dwellings in a given stratum,
- the likelihood of choosing each primary sampling unit is proportionate to the number of dwellings in it (a systematic sampling using Hartley-Rao method is used for primary sampling units ranked in random order).

A sample with 675 primary sampling units drawn two years before the survey and a sample with identical size – 675 primary sampling units – drawn one year before the survey are used in the survey.

During the second stage, six dwellings for the main sample and six dwellings for the reserve sample are drawn using a simple sampling method in every primary sampling unit. The overall number of dwellings in the main sample amounts to 8100.

Generalisation of survey results

In sample surveys only a small part of the population is surveyed and information collected from households and individuals is generalised to the entire population, that is they are multiplied by accurately calculated numbers called weights.

Firstly, weights are calculated for every household resulting from drawing:

$$\text{weight}_{\text{hos}} = \frac{\text{mdwh}}{\text{lmh}}$$

where:

mdwh – number of dwellings in a stratum,

lmh – number of all visited dwellings in a given stratum, that is dwellings in which an interview was and wasn't conducted.

Weights from drawing sum up to a slightly higher number than the number of dwellings. It is an estimated number of households (in some dwellings there is more than one household). Then, weights from drawing are adjusted in two stages. Firstly, weights are adjusted in relation to completeness. Values of R_a and R_g are determined. Information concerning conducting an interview included in variables I1, Y2, Y3 and Y4 (Questionnaire for households SSI-10G, Section Y – Conducting an interview) is used for this purpose.

R_a (contact rate) is a ratio of households with which contact was made ($Y1=1$) to the number of all households ($Y1=1,2$), except for those with $Y2=1,2,3,4$ (no such address, unoccupied dwelling, demolition of a dwelling or change of dwelling's use) – dwellings which do not exist. The number of households is calculated with the use of weights from drawing but only one household from a dwelling is taken into account.

$$R_a = \frac{(Y1 = 1)}{(Y1=1,2)-(Y2=1,2,3,4)}$$

R_g (response rate) is a ratio of the number of households with which an interview was conducted ($Y3=1$) to the number of contacted dwellings ($Y1=1$), except for those without persons aged 16-74 ($Y4=1$) and cases where a different household lives in a dwelling than in the previous year ($Y4=6$).

$$R_g = \frac{(Y3 = 1)}{(Y1=1)-(Y4=1,6)}$$

Next, weight from a drawing is divided by R_a and R_g for every dwelling. Weight obtained in such way is called w_1 .

$$w_1 = \frac{\text{weight_los}}{R_a \times R_g}$$

The above mentioned adjustment is done for six classes of localities:

1. Warsaw,
2. Kraków, Łódź, Poznań, Wrocław and Gdańsk, Gdynia and Sopot,
3. other cities with over 100 thousand inhabitants,
4. cities with 20 thousand to 100 thousand inhabitants,
5. cities with up to 20 thousand inhabitants,
6. rural areas.

Calibration of weights is another step. External data for calibration concern households and individuals. 12 classes of households and 24 classes of individuals are created. As for households, the number of persons in a household (one-, two-, three-, four-, five-, six- or more persons) and place of residence: urban-rural area is a division criterion. Data on the number of households with at least one person aged 16–74 came from the National Census of Population and Housing 2011.

As for individuals, division criteria took into account sex, age and place of residence: urban or rural area. Data come from Demography Database and were adjusted by the number of persons living in collective accommodation establishments from the National Census 2011.

Calibration aims at the smallest “adjustment” of weight w_1 so that the ratio of final weight w_2 to weight w_1 is the closest to one and at the same time generalisations with final weights reflected determined external data.

Weights for individuals are determined separately. Firstly, weight w_2 of a household to which a person belongs is attributed to every person. Next, it is adjusted taking into account non-responses of individuals in classes: urban/rural area, sex, age groups (24 classes).

R is a ratio of the number of persons who were surveyed ($Y1=1, 2$) to the number of all persons in a surveyed households: information concerning conducting an interview included in variable $Y1$ (Questionnaire for individuals SSI-10I, Section Y – Conducting an interview) is used.

$$R = \frac{(Y1 = 1,2)}{(Y1 = 1,2,3)}$$

$$\text{weight_os} = \frac{w_2}{R}$$

Precision of results

Results of sample surveys are always affected by sampling errors resulting from the fact that a small part of a population is surveyed and results are generalised. Standard error and coefficient of variation (CV) are the measures of these errors applied to results of this survey. Minimal error usually occurs for data for the whole country, while the biggest – for data in social and economic groups which are not numerous in the whole population (e.g. households with one adult or a child/children under 16 years) or in which a phenomenon is not widespread (np. contact with public administration by sending filled-in forms among persons over 65 years, purchasing or selling stocks, bonds among persons with primary or lower secondary education, etc.).

2.3. Characteristics of data collection tools

Model questionnaires and data collection tools

In the survey on ICT usage two types of questionnaires are used:

- SSI-10G – household questionnaire
- SSI-10I – individual questionnaire.

Questionnaires used in the survey have a strictly determined layout. A heading includes a symbol of a voivodship, the number of a household, logo of Statistics Poland and contact address, symbol of a survey and its name. Further part includes sections corresponding to the objective scope of the survey. In a questionnaire SSI-10I (an individual questionnaire) the penultimate section concerns characteristics of a surveyed person. The last section in both questionnaires concerns conducting an interview with possible notes of an interviewer, date of conducting an interview and duration of an interview. Current model questionnaires are available on the website <http://stat.gov.pl/> under Household and agricultural surveys.

Data collection methods

The survey is conducted with the use of CAPI and CAWI/CAII methods.

In order to register data, interviewers use laptops with CAPI software (Computer Assisted Personal Interview) which is an electronic version of a questionnaire together with a control system for entered data with regard to their logical and calculating integrity. Collected results are then sent via the Internet to a central database for further processing. This system makes work of interviewers easier and significantly reduces the number on systematic errors occurring during data collection. Thanks to this system, errors generated by the previously used system OCR and errors that can be foreseen and presented as logical conditions in assumptions for data control were completely eliminated.

A dedicated application CAWI/CAII to collect data from respondents has been developed for the purpose of this survey.

An application represents questionnaires SSI-10G ICT usage in households – a household questionnaire and SSI-10I ICT usage by individuals – an individual questionnaire which due to an electronic implementation are considerably personalised and initially filled-in with information regarding every unit covered by the survey. An application is intended for work in an Internet browser and thanks to integration with a system for managing interview surveys CORstat, it uses a number of services related to authentication and monitoring the implementation of the survey.

Before a CAWI/CAI application is developed, assumptions based on routing prepared for CAPI method are determined. Functionalities of an application which are important for persons working in web browser environment are described in detail.

Works related to developing a CAWI/CAI application are divided into server works (supporting database servers, application servers) and visual works (application display in a browser).

A server part uses Tomcat server in which a CAWI/CAI application written in Java is implemented. Communication with application takes place via REST API services. Data are stored in databases SQL Server and Cassandra.

A visual part is written with tools using JavaScript language – Vue.js together with a library of UI components Vuetify.js. Used languages include JavaScript in ES6, HTML and CSS standard. Display style is based on a Material Design standard. Supporting technologies include, i.a. Webpack (to develop applications in JavaScript), Vuex (implementation of Flux architecture for managing a state of an application), vuex-persist (to save the state of an application in memory of a user's browser).

After developing an application, it is tested in order to check used validations and general organisation of the survey on a website. If testing detects discrepancies, they are corrected before the survey starts so that works on a production version are finished. It is published on a website <https://cs.stat.gov.pl/SSI-10/>.

Thanks to the use of an internet application technology, technological neutrality of a tool is ensured (a respondent can run an application in any system environment offering Internet access), without the need to install additional items on a computer which could raise doubts with regard to IT security and, in consequence, decrease interest in the survey.

Flexible design and up-to-date technical solutions allow the conclusion that a tool with high innovation potential, which can be developed during subsequent similar surveys, is used in the survey.

Access to an application with an electronic questionnaire requires confirmation of eligibility and identity of a user.

Authenticating data of users with a login and password are generated in CORstat system and then distributed on the basis of a received survey file. Successful logging to an application is confirmed by displaying a start screen with identifying data of a unit (main unit), which means that a user works for an appropriate unit. A user is directed to a substantial part of a questionnaire after pressing a button "Fill-in".

An electronic questionnaire application in the survey SSI-10 ICT usage in households is divided into functional modules displayed in different views within one website, designed in a coherent layout making an application ergonomic and user-friendly. It is worth mentioning that responsiveness of an application, which enables work on various types of devices, i.a. PC, tablet, telephone, was ensured.

2.4. Selected variables used in the survey

Households with access to the Internet

Access to the Internet includes both fixed and mobile Internet connection.

Fixed connections cover wired and wireless connections, e.g. DSL, ADSL, VDSL, cable modem, fiber optic cable, satellite connections, public radio connections (Wi-Fi).

Mobile connections include connections via mobile phone network, e.g. 3G or 4G technology, via a SIM card or USB card, a mobile phone or smartphone as a modem.

Households incurring expenditures on IT equipment and software.

IT equipment includes:

- IT equipment (computer sets, laptops),
- computer components (motherboards, processors, disks and drives, RAM memory, graphics and music cards, etc., power supplies, enclosures, wires),

- devices enabling communication between users and computers: computer monitors, keyboards, mouse devices, loudspeakers (if they are connected to the computer, not to TV or stereo sets) Internet cameras, etc.,
- telecommunication equipment used to connect with the Internet or create home/neighborhood computer networks: modems (telephone analog modems, DSL modems or cable modems used in cable TV networks), routers, concentrators and switches, Wi-Fi stations, cables, wires, etc.,
- peripheral devices (printers, scanners, modems, removable disks, USB memory),
- accessories and consumables (toners or inks for printers, storage media e.g. DVDs).

Software includes games and apps.

Persons using the Internet in the last 3 months.

Persons not using the Internet.

Persons using the Internet on a regular basis.

Regular Internet users include persons using the Internet at least once a week.

Persons using mobile devices.

Mobile devices include smartphones (mobile phones), laptops, tablets and other mobile devices (e.g. media players or portable game consoles, e-book readers, smartwatches).

Persons using the Internet for communication.

Communication is understood as doing the following activities:

- sending and receiving e-mails,
- making voice or video calls over the Internet,
- participating in social networks,
- using instant messaging.

Persons finding information about goods or services.

Persons looking for a job or sending job application.

Persons listening to music over the Internet.

Persons watching internet streamed TV; using VOD.

Persons using e-health services.

Persons using Internet banking.

Persons using cloud computing.

Using cloud computing is understood as saving documents, pictures, music or video files, etc. in storage space.

Persons using e-government.

Using e-government is understood as:

- obtaining information from websites or apps,
- downloading/printing official forms,
- submitting completed forms on-line.

Persons not sending completed forms.

Persons buying goods and services over the Internet.

Persons carrying out computer related activities.

Computer or mobile device related activities include:

- transferring files between computers or other devices,
- installing software or applications,
- changing the settings (options/preferences in menu „tools“) of any software, operating system or security programs.

Persons carrying out software related activities.

Software related activities include:

- coping or moving files or folders,
- using advanced word processing software,
- creating presentations or documents integrating text, pictures, tables or charts,
- using spread sheet software,
- using software to edit photos, video or audio files,
- writing code in a programming language.

Persons using the Internet of things.

2.5. Organisation and management of the survey implementation

The Statistical Office in Szczecin conducts the survey on ICT usage in households and by individuals and supervises it substantially. The Statistical IT Centre is responsible for organisation of processing information, software and computing result tables.

The substantial supervision is performed in the Centre for Science, Technology, Innovation and Information Society Statistics by a team of employees under a direction of a survey coordinator.

Tasks of substantial team include:

- preparing the programme of statistical surveys of official statistics,
- preparing model questionnaires for the survey,
- preparing assumptions for logical and calculating control,
- preparing templates of result tables together with algorithms,
- preparing a survey schedule,
- assigning tasks related to implementing survey,
- supervision over the course of survey,
- controlling errors in a dataset,
- analysing tables with actual and generalised data,
- approval of a national dataset,
- preparing templates and data for publication,
- preparing algorithms for computing data for Eurostat,
- verification of data computed for Eurostat,
- marking unreliable data and statistical confidentiality,
- on-going monitoring of issues related to the information society,
- co-operation with institutions on a national level and with Eurostat.

A substantial team closely co-operates with:

- The Department for Programming and Coordination in relation to creating model questionnaires, schedules and provisions in the Programme of Statistical Surveys of Official Statistics,
- The Statistical IT Centre in relation to designing an electronic questionnaire, assumptions for a survey IT system, computing result tables and transmission of data to Eurostat,

- The Department of Interview Surveys in the Statistical Office in Szczecin,
- Interviewing coordinators in statistical offices in relation to on-going explanation of issues and problems concerning implementation of the survey.

Interviewers who are employees of statistical offices conduct the survey in all voivodships. Their duties include visiting all drawn dwellings (from the main sample) and conducting interviews with all households living in a given dwelling. Dwellings drawn for the survey are used in two editions of the survey, in two subsequent years. If an interview was not conducted in the first year due to refusal or other reason, a dwelling should be visited in the following year and an interviewer should try to conduct an interview. Obtaining the largest number of reliable answers and ensuring respondents' confidentiality is also a responsibility of an interviewer.

The survey has to be implemented in accordance with a prepared handbook and adhering to ethics of a statistician, especially the principle of respecting a respondent, maintaining statistical confidentiality and protecting collected data – pursuant to the Act of 29 June 1995 on Official Statistics (Journal of Laws of 2018, item 997, as amended).

A coordinator who is responsible for implementing a task in a given survey area supervises the work of interviewers. Areas are divided in accordance with territorial division into voivodships. Inspectors help coordinators in their work.

INSPECTOR – a person chosen from employees of a statistical office whose knowledge and experience allow to supervise an implementation of a survey (interviewing, registering data, transferring data, analysis and revision) by a group of interviewers.

COORDINATOR – a person responsible for a proper course of the survey, proper training of interviewers and inspectors as well as supervision over their work. He/she is an employee of a statistical office, has complex knowledge about methodology of the survey, sociological aspects of interviewers' work and impact of errors on the quality of data. Due to territorial range of activities, coordinators are established in branches and in voivodships.

Before the survey begins, a letter of the President of Official Statistics and a leaflet presenting selected results of the survey on ICT usage from the previous years are sent to families living in drawn dwellings. The President's Letter emphasises significance of the survey for official statistics, encourages Internet self-enumeration as well as contains basic information regarding the course of the survey and publishing results as well as guaranteed complete confidentiality of collected information.

2.6. Data presentation

Forms of publication and databases with results

Results of surveys are disseminated by Statistics Poland in the form of publications, news releases and result tables. They are available on the website of Statistics Poland (www.stat.gov.pl).

The main publication which is an analysis of data collected in a surveyed year is Information society in Poland. Results of statistical surveys from the years (...). The basic range of information is also published in statistical yearbooks.

Up to 2010 publications covered the years: 2004–2006, 2004–2007 and 2004–2008. Next edition covered the years 2006–2010 and the following editions have been published annually and cover the period of the past five years.

Survey results are also transferred to EUROSTAT and are published after comparison with results from other EU Member States. The main form of information dissemination is a database on Eurostat website as well as statistical publications (also electronic) and short articles published as Products Eurostat News.

The most important tools for disseminating data from the survey on the ICT usage in households:

Statistics Poland website

Tables – selected indicators (total, by age and sex, age and education, education and sex, employment situation, type of household, income groups of household, occupation, class of place of residence, class of place of residence and economic activity in rural areas, degree of urbanization, using social assistance and disability, type of Internet connection at home and frequency of using the Internet, macroregions NUTS 1 and class of place of residence, voivodships and NUTS 2 regions, parts/regions and class of place of residence).

Publication Information society in Poland. Results of statistical surveys from the years (...)

Published annually in December, available in a paper and electronic version. It includes selected indicators in a breakdown by age, sex, regions, voivodships, education, employment situation, place of residence, degree of urbanization and comparisons with EU Member States.

Leaflet *How do we use the Internet?*

Published annually in March, available in a paper and electronic version. It includes indicators: access to the Internet (including broadband) in comparison with EU Member States, use of e-Government, use of e-Commerce, purposes of using the Internet, reasons for lack of access to the Internet.

Concise Statistical Yearbook of Poland

Published annually in July, available in a paper and electronic version. It includes indicators: households equipped with computers, access to the Internet, access to the broadband Internet, place of using the Internet, purposes of using the Internet in a breakdown by class of place of residence.

Statistical Yearbook of the Republic of Poland

Published annually in December, available in a paper and electronic version. It includes indicators: access to the Internet (including broadband), place of using the Internet, purposes of using the Internet in a breakdown by class of place of residence.

Eurostat website

Tables – selected indicators in comparison with other countries, published annually.

Eurostat publication *Digital economy and society in the EU – a browse through our on-line world in figures*

Includes selected indicators in comparison with other countries, published annually.

Macroeconomic Data Bank

Includes selected indicators (by classes of place of residence, education level, selected groups of goods and services), updated annually.

STRATEG

Includes selected indicators in total, updated annually.

Breakdowns**Household survey**

Survey results concerning households are presented in the following breakdowns:

Breakdown E – by type of household

This breakdown presents households with children under 16 years and without children under 16 years. Next, each group is divided into a household with one, two or three adults.

Breakdown F – by income group of a household after calculating quartile groups

Division of households according to income into quartile groups consists in ranking households according to an average net monthly income and then in dividing obtained set into four equal parts.

The first quartile group includes $\frac{1}{4}$ of households with the lowest income, the second – households with income higher than the first group but still below the value of income dividing a set of households into halves, the third - $\frac{1}{4}$ of households with income higher than in the second group but not included in the fourth group which includes $\frac{1}{4}$ of households with the highest income.

Breakdown F-q – by income group of a household after calculating quintile groups

Division of households according to income into quintile groups consists in ranking households according to an average net monthly income and then in dividing obtained set into five equal parts.

The first quintile group includes $\frac{1}{5}$ of households with the lowest income, the second – households with income higher than the first group but still below the value of income dividing set of households into halves, the third one includes households with income the closest to the value of median, the fourth – $\frac{1}{5}$ of households with income higher than in the third group but not included in the fifth group which includes $\frac{1}{5}$ of households with the highest income.

Breakdown H – by class of place of residence

Three classes of place of residence are used in the survey:

- big cities – with number of inhabitants exceeding 100 000,
- smaller cities – with number of inhabitants below 100 000,
- rural areas.

Breakdown H-agricultural – by class of place of residence and type of economic activity in rural areas

This breakdown presents households in a breakdown by class of place of residence, like in a breakdown H. Additionally, the following breakdown is presented for rural areas:

- households with at least one farmer,
- households with at least one farmer and without persons not working in agriculture.

Breakdown I – by degree of urbanisation

Breakdown of households by degree of urbanisation includes three categories:

- densely populated areas – a set of contiguous territorial units (or a single territorial unit), all of which have a density of at least 500 inhabitants per km² and a population of at least 50 000 inhabitants.
- areas of intermediate density – a set of contiguous territorial units (or a single territorial unit), all of which have a density of at least 100 inhabitants per km² and at the same time either a total population of at least 50 000 inhabitants or is contiguous to a densely populated area.
- thinly populated areas – a set of contiguous other territorial units; a set of territorial units whose total area does not exceed 100 km²
- should be classified as a thinly populated area due to population density and the number of population, however, if it is completely surrounded by densely populated areas or areas of intermediate density, it is considered as a part of densely populated area or area of intermediate density, respectively.

Breakdown M – by macroregions NUTS 1 (NUTS 2016) and class of place of residence

This breakdown presents households by classes of place of residence (like in a breakdown H) and macroregions in accordance with the following classification.

Table 1. Division of Poland by macroregions

Macroregions	Voivodships included in a macroregion
Central	Łódzkie, Świętokrzyskie
South	Małopolskie, Śląskie
East	Lubelskie, Podkarpackie, Podlaskie
North-West	Wielkopolskie, Zachodniopomorskie, Lubuskie
South-West	Dolnośląskie, Opolskie
North	Kujawsko-pomorskie, Warmińsko-mazurskie, Pomorskie
Mazowieckie voivodship	Mazowieckie

Source: own study.

Breakdown W – by voivodships and regions NUTS 2 (NUTS 2016)

In accordance with NUTS 2 classification.

Breakdown S – by parts/ regions and class of place of residence

This breakdown presents households by class of place of residence (like in a breakdown H) and regions (West, Central and East) – in accordance with the following classification.

Table 2. Division of Poland by parts/regions

Parts/Regions	Voivodships included in a region
East Poland	Lubelskie, Podlaskie, Podkarpackie, Świętokrzyskie, Warmińsko-mazurskie
Central Poland	Kujawsko-pomorskie, Łódzkie, Małopolskie, Mazowieckie, Pomorskie, Śląskie
West Poland	Dolnośląskie, Lubuskie, Opolskie, Wielkopolskie, Zachodniopomorskie

Source: own study.

Breakdown T – by less developed and more developed regions

In accordance with the following classification.

Table 3. Polish regions by level of development

Specification	Voivodships included in a region
More developed regions	Mazowieckie
Less developed regions	Dolnośląskie, Kujawsko-pomorskie, Lubelskie, Lubuskie, Łódzkie, Małopolskie, Opolskie, Pomorskie, Podlaskie, Podkarpackie, Śląskie, Świętokrzyskie, Warmińsko-mazurskie, Wielkopolskie, Zachodniopomorskie

Source: own study.

Individual survey

Survey results concerning individuals are presented in breakdowns described above for households (apart for breakdowns by type of household and class of place of residence and type of economic activity in rural areas) and additionally by the following breakdowns:

Breakdown A – by age and sex

Age is given in complete years in bands: 16–24, 25–34, 35–44, 45–54, 55–64, 65–74 years.

Breakdown B – by age and education

This grouping includes three levels of attained education:

- tertiary education including persons with bachelor, engineer or master degree or persons with academic degree or title (doctor, habilitated doctor, professor),
- secondary education including persons who graduated from secondary school, vocational schools and post-secondary schools,
- lower secondary or primary education including persons who graduated from primary school, lower secondary school or a small group of persons without any education.

Breakdown C – by education and sex**Breakdown D – by employment situation**

1. In the labour force:
 - a. employee or self-employed:
 - employee,
 - self-employed,
 - farmers,
 - b. unemployed;

2. Not in the labour force:
 - a. student,
 - b. in retirement and others.

Breakdown G – by occupation

This grouping presents persons working in manual, non-manual and ICT-related occupations. As ICT- related occupations, Eurostat's Methodological manual for statistics on the Information Society recommends considering the following occupation groups according to ISCO 08 classification as ICT specialists:

- 25 Information and communications technology professionals,
- 35 Information and communications technicians,
- 133 Information and communications technology service managers
- 2356 Information Technology Trainers,
- 7422 Information and Communications Technology Installers and Servicers.

Breakdown J – by using social assistance and disability

This grouping presents a breakdown by persons using social assistance, persons with disability and persons with disability using social assistance.

Breakdown K – by type of Internet connection at home and frequency of using the Internet

- Access to the Internet at home:
 - Broadband,
 - Narrowband;
- Using the Internet:
 - Regularly – at least once a week,
 - Irregularly;
- Persons with broadband access and using Internet regularly.

2.7. Data evaluation – preliminary assessment of the survey quality and data reliability

When interviewers finish their work a dataset is checked with regard to logical and calculating correctness in two stages – firstly on a voivodship level, next – on a national level. During control inspectors and substantial coordinators clarify with interviewers ambiguous situations or errors in entered data. All discretionary errors which remain in a dataset have to be analysed by interviewers and accepted by voivodship coordinators.

After sending information to the Statistical Office in Szczecin about acceptance of a dataset in each voivodship, control of correctness and completeness of datasets on a national level is performed. Works on completeness of datasets include also imputation of missing answers with the use of appropriate statistical methods. Imputation (replacing data missing in a dataset with artificially created imputation values) is used only for item nonresponse, that is lack of answer to a single question for a given household or a person. Imputation does not include unit nonresponse, that is all data for households or individuals with whom an interview was not conducted.

Refusal to answer a question by respondent is allowed due to sensitivity of collected data, e.g. questions about income of a household or expenses. In such case a hot-deck method belonging to the group of stochastic methods (which do not distort distribution of variables) is used. Imputation with a hot-deck method consists in replacing missing data with values from so-called donors drawn from complete records. It means that imputed values of missing data were drawn from records fulfilling determined criteria of similarity, that is records belonging to the same imputation group.

3. Survey on ICT usage in enterprises

The surveys on ICT usage in enterprises have been conducted by statistical offices of EU Member States since 2002. In the first edition 15 Member States participated and 137 thousand enterprises employing at least 10 persons were covered. In Poland the first survey was conducted in 2004. It was a pilot survey and 6 thousand enterprises operating across the whole country took part in it. Since 2005 Regulations No 808/2004 and 1006/2009 establishing a single system of international information society statistics have imposed an obligation to conduct surveys in all Member States. They constitute a basis for including these surveys into the programme of statistical surveys of official statistics.

3.1. Subjective and objective scope of survey

For the surveys on ICT usage in enterprises, a statistical unit is defined on the basis of an enterprise definition included in the Council Regulation (EEC) No 696/93 of 15 March 1993:

“The enterprise is the smallest combination of legal units that is an organizational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit.”

Objective scope of surveys includes units broken down to:

- the non-financial sector,
- the financial sector.

The following criteria are taken into account when units for the survey are selected:

1. basic legal form: legal person, organisational unit without legal personality, natural person conducting economic activity,
2. special legal form: professional partnership, joint stock company, limited liability company, registered partnership, partnership, limited partnership, limited joint-stock company, company included in provisions of acts other than commercial companies code and civil code, state enterprises, cooperatives, branch of foreign company, company without special legal form.
3. number of persons employed – at least 10 persons,
4. type of conducted economic activity according to the Polish Classification of Activities (till 2008 the Polish Classification of Activities 2004, since 2009 according to the Polish Classification of Activities 2007). Surveys cover entities which conduct economic activity classified according to the Polish Classification of Activities 2007 to the following sections and divisions:
 - from the non-financial sector:
 - Section C – Manufacturing,
 - Section D – Electricity, gas, steam and air conditioning supply,
 - Section E – Water supply; sewerage; waste management and remediation activities,
 - Section F – Construction,
 - Section G – Wholesale and retail trade; repair of motor vehicles and motorcycles,
 - Section H – Transporting and storage,
 - Section I – Accommodation and food service activities,
 - Section J – Information and communication,
 - Section L – Real estate activities,
 - Section M – Professional, scientific and technical activities (excluding division 75 – Veterinary activities),
 - Section N – Administrative and support service activities,
 - Section S – Other services activities –group 95.1 Repair of computers and communication equipment.
 - from the financial sector:
 - Section K – Financial and insurance activities.

An enterprise is both an observation unit and a unit of statistical analysis. The subject matter of the survey is ICT usage in enterprises. A detailed objective scope is prepared on the basis of a model questionnaire which all Member States are required to implement. A model questionnaire is prepared in cooperation of Eurostat with Member States. During meetings of Working Groups and Task Forces, which attend national coordinators of surveys (Poland is represented by employees of the Statistical Office in Szczecin), a structure of a questionnaire is determined on the basis of jointly defined questions and answers. Representatives of the European Commission and the OECD who suggest new topics to be included in the survey also take part in meetings.

Due to the dynamic development of the information society, the need for data characterising this development is enormous. In view of the limited length of a questionnaire due to the problem of response burden, the objective scope of a model questionnaire partially changes year by year. Some issues are surveyed permanently, while other once, biennially or triennially. An annex (tables 3 and 4) presents an objective scope of enterprise surveys since 2005.

Apart from issues which are important on a European level, issues significant for Poland are also surveyed. During annual consultations concerning the programme of statistical surveys of official statistics proposals concerning issues that should be covered by the survey are submitted.

Indicators collected during enterprise surveys are used to monitor the level of implementing the European strategy Monitoring Digital Economy and Society 2016–2021 in which implementing ICT in enterprises is one of main objectives. It is also worth to mention the strategy Digital Single Market whose one pillar is facilitating access to digital goods and services in the entire Europe to customers. Indicators are also used by public administration bodies to verify national and local strategies such as Operational Programme Digital Poland, National Urban Strategy, Efficient State, Social and Economic Development of Eastern Poland and Regional Operational Programmes. Recipients of data include also scientific entities, media and individuals.

3.2. Survey method

The indicators on ICT usage in enterprises are collected through two separately conducted surveys. One of them covers enterprises from the financial sector (classified according to the Polish Classification of Activities 2007 to section K) and is a full-scale survey. The second one covers enterprises from the non-financial sector (classified according to the Polish Classification of Activities 2007 to sections C–J, L–N, S) and is a sample survey.

The survey frames are generated from the Statistical Units Database on the basis criteria mention in the part “Subjective and objective scope of survey”. In the case of a sample survey, a frame is a basis for sampling. A sampling scheme is based on proportional stratification in every stratum. Basic strata are determined on the basis of conducted economic activity according to the Polish Classification of Activities (25 groups, variable RD) and employment (3 size classes, variable WLK). Some exceptions are made and all enterprises which meet the following criteria are included in a sample:

- in which the number of persons employed exceeds 249 persons,
- from breakdowns WLK*RD with size smaller than 200.

The remaining part of a sample is allocated in strata WLK*RD*WON*NTS1 (variables WON and NTS1 are used to determine location of an enterprise) solving the following formula: $nh=0,6*$ (allocation proportional to size of a stratum) $+0,4*$ (allocation to root from size of a given stratum). Using such allocation of a sample (in order to improve precision) results in a slight overrepresentation of the smallest strata at the expense of bigger ones, especially in not numerous breakdowns.

In a pilot survey conducted in 2004 the sample amounted to 6.5 thousand enterprises. In order to improve representativeness, a sample has been increased three times. In 2019 it amounted to 19.6 thousand enterprises which constituted 18% of a frame. A survey file of a full-scale survey amounted to almost 1.3 thousand enterprises.

A survey file includes information on sampled entities necessary for proper implementation of a survey during all stages, i.a.:

- name of an entity,
- contact details,
- legal form,
- ownership form,
- type of conducted activity (according to the main activity),

- information about location of an entity (according to the registered seat),
- number of persons employed,
- contact details of a person filling in a questionnaire for Statistics Poland.

Moreover, in order to improve validation of data collected in the current survey and maintain integrity with other surveys in terms of the same variables, a survey file also includes information concerning:

- answers given by an enterprise in the previous edition of the survey if it fulfilled its reporting obligation,
- answers given by an enterprise in surveys DG-1 and F-01 in terms of variables on the number of persons employed and revenue if it fulfilled its reporting obligation.

Indicators obtained via a sample survey should characterise the whole population. Therefore, data collected from respondents are generalised resulting in weights assigned to every entity in a sample. Generalisation concerns all variables in the survey. Classical estimators resulting from the stratified sampling scheme are used. Output weights (primary) result from an adopted allocation in a stratified sampling scheme and are equal to the ratio of the size of a frame to the size of a drawn sample in a given stratum. However, primary weights have to be properly adjusted before generalisation due to the cases of non-response. Adjustment takes into account the phenomenon of non-response and information about reasons for not obtaining data from some entities. Multipliers for adjusting weights from sampling are determined on the level of strata aggregated to the level WLK (3 size classes) x RD (type of economic activity according to the Polish Classification of Activities) taking into account information for the whole sample included in symbols RA (symbols of participation in the survey).

An adjusting multiplier is calculated with the use of the following formula:

$$wk = \frac{N_{1h} + N_{2h} + N_{3h} \cdot \frac{N_{1h} + N_{2h}}{N_h - N_{3h}}}{N_{1h}}$$

where:

N_h – weighted size of a drawn sample in a given aggregated stratum (all RA),

N_{1h} – weighted size of a surveyed sample in an aggregated stratum (RA = 01),

N_{2h} – weighted number of entities which refused to fill in a questionnaire (RA = 22),

N_{3h} – weighted number of entities from an aggregated stratum with which contact was not established (RA = 24).

In the above mentioned formula, primary weights resulting from sampling are used for summing up. An adjusting multiplier is an estimated ratio of the number of entities that should be surveyed to the number of surveyed entities in a given stratum. All cases of refusal and proportionally some cases of lack of contact were included in the group of entities belonging to the population of interest.

The final weight results from multiplying a primary weight by an adjusting multiplier.

Results of sample surveys are always affected by sampling errors. Generalisation of results on the basis of a small number of cases leads to collecting unreliable data. Such phenomenon is called low precision of survey results. Standard error and coefficient of variation (CV) are the measures of precision of results used in survey on non-financial enterprises. Issues concerning quality of data are described in detail in section "Survey evaluation – preliminary assessment of the survey quality and data reliability".

3.3. Characteristics of data collection tools

The survey ICT usage in enterprises is conducted via the Reporting Portal with the use of an electronic questionnaire (Computer Assisted Web Interview method – CAWI) which constitutes a basic tool for collecting data. If an enterprise does not have an active account on the Reporting Portal, it is possible to fill in and submit a questionnaire in a paper form. Moreover, a respondent can fulfil a reporting obligation by providing necessary information to a statistician during a telephone interview.

Electronic questionnaires are a representation of a set of data (questionnaires) SSI-01 and SSI-02 determined in the Programme of Statistical Surveys of Official Statistics for a given year and contain questions concerning:

- ICT usage, mandatory in a given survey edition (more information in a part “Subjective and objective scope of survey”),
- organizational and legal features,
- respondent burden,
- revenues of an enterprise,
- identification data.

Answers are given on an electronic questionnaire via:

- ticking a correct answer or selecting from a list – a so-called “glossary”,
- providing a numeric value in a box.

3.4. Selected variables in the survey

Enterprises using computers for business purposes

Computers include personal computers (PC), portable computers (e.g. laptops, notebooks, netbooks), tablets, other portable devices such as smartphones.

Persons employed using computers for business purposes

Enterprises employing ICT specialists

ICT specialists are employees for whom ICT is the main job. This term should not correspond to “ICT professionals” used in classification of occupations ISCO 08 (25 Information and communications technology professionals, broken down to 251 Software and applications developers and analysts, and 252 Database and network professionals). In the survey it is important to grasp a broader context concerning specialist; the key factor is performing ICT-related activities during most of working time. This definition is quite flexible, however, Methodological Manual for statistics on the Information Society recommends considering the following ISCO 08 occupation groups as ICT specialists:

- 133 Information and communications technology service managers
- 2152 Electronics engineers
- 2153 Telecommunications engineers
- 2166 Graphic and multimedia designers
- 2356 Information technology trainers
- 2434 Information and communications technology sales professionals
- 25 Information and communications technology professionals
- 251 Software and applications developers and analysts
- 252 Database and network professionals
- 35 Information and communications technicians
- 351 Information and communications technology operations and user support technicians
- 352 Telecommunications and broadcasting technicians
- 7422 Information and communications technology installers and servicers

Enterprises proving training to develop ICT related skills of the persons employed – in a breakdown by ICT specialists and other persons employed

Enterprises recruiting ICT specialists

Enterprises with vacancies for ICT specialists that were difficult to fill

Enterprises in which ICT functions were performed by own employees and/or external suppliers

ICT functions include maintenance of ICT infrastructure, support for office software users, development and support for software, business management systems, web solutions, ICT security and data protection. Development and maintenance of software is understood as developing tailor-made, customised software from scratch as well as customisation of purchased, packaged, off-the-shelf software. Sole purchase of standard software in regular sales (without any modification) is not a task related to ICT as well as a standard update of regular antivirus software.

Enterprises with access to the Internet

Concerns access to the Internet via a fixed connection (also wireless, e.g. Wi-Fi) and a mobile connection.

Persons employed using a computer with access to the Internet for business purposes

Enterprises with broadband access to the Internet

This category includes fixed broadband connections (e.g. ADSL, SDSL, VDSL, fiber optic technology, cable technology, public Wi-Fi) and mobile broadband connections (e.g. at least 3G).

Enterprises using fixed broadband connections to the Internet for business purposes

This category includes DSL technologies (ADSL, SDSL, etc.) and other, e.g. fiber optic technology, cable technology, satellite connection, fixed wireless connection.

Enterprises whose maximal contracted speed of the fastest fixed Internet connection falls within the following bands:

- Less than 2 Mbit/s,
- At least 2 but less than 10 Mbit/s,
- At least 10 but less than 30 Mbit/s,
- At least 30 but less than 100 Mbit/s,
- At least 100 but less than 500 Mbit/s,
- At least 500 Mbit/s.

Enterprises using mobile broadband connection to the Internet for business purposes

A mobile connection to the Internet means the usage of portable devices (e.g. laptops, tablets, smartphones) connected to the Internet via mobile telephone networks. Mobile connections should not be confused with wireless connections (e.g. Wi-Fi, Bluetooth).

Enterprises providing persons employed with portable devices that allow Internet connection via mobile telephone networks

Persons employed provided with portable devices that allow Internet connection via mobile telephone networks, for business purposes

Enterprises having a website

Enterprises whose website has determined functionalities.

The following functionalities are distinguished:

- description of goods or services, price lists,
- online ordering or reservation or booking, e.g. shopping cart,
- possibility for visitors to customise or design online goods or services,
- tracking or status of orders placed,
- personalised content on the website for regular/recurrent visitors,
- links or references to the enterprise's social media profiles,
- advertisement of open job positions or online job application.

Enterprises using social media

The following types of social media can be distinguished:

- social networks (e.g. Facebook, LinkedIn, GoldenLine, Google+),
- enterprise's blog or microblogs (e.g. Twitter, Blogger, Tumblr, Present.ly),
- multimedia content sharing websites (e.g. YouTube, Flickr, Instagram, Pinterest, SlideShare, Snapchat),
- wiki based knowledge sharing tools.

Enterprises using social media for certain purposes.

The following purposes of using social media can be distinguished:

- developing the enterprise's image or marketing products (e.g. advertising or launching products),
- obtaining or responding to customer opinions, reviews, questions,
- involving customers in development or innovation of goods or services,
- collaborating with business partners (e.g. suppliers) or other organisations (e.g. public authorities, non-governmental organisations),
- recruiting employees,
- exchanging views, opinions or knowledge within the enterprise.

Enterprises using services of electronic public administration

Electronic public administration – public administration using ICT, which together with organisational changes and acquiring new skills by persons employed is supposed to improve public services and democratic processes as well as stronger support for programs created by administration.

Enterprises using services of electronic public administration for a specific purpose:

- offering goods or services in public authorities' electronic procurement systems (eTendering),
- returning filled in forms electronically (to the Social Insurance Institution, submitting statistical information to bodies of official statistics, submitting the declaration of VAT), of which for more than 3 official businesses/procedures,
- treating an administrative procedure completely electronically (e.g. submitting declarations, registration, request for authorisation) without additional paper documents (including a payment if was required), of which for more than 3 official businesses/procedures.

Enterprises using open data for business purposes

Public open data are data of institutions, offices which every citizen can use.

Enterprises using a given category of open data for business purposes

The following categories of public open data can be distinguished:

- economy and finance,
- spatial data,
- transport,
- culture, sport, leisure,
- environment,
- education,
- other.

Enterprises using cloud computing services used over the Internet

Cloud computing services offer a possibility to use scalable ICT services with the use of the Internet. Services offered in a cloud include access to software, using certain computing power, data storage.

Mentioned services:

- are delivered from servers of service providers
- can be easily scaled up or down (e.g. number of users or change of storage capacity),
- can be used on-demand by the user (without human interaction with the service provider),
- are paid for, either per user, by capacity used, or they are pre-paid.

Enterprises buying cloud computing services used over the Internet

The following categories of cloud computing services can be distinguished:

- e-mail,
- office software, e.g. Office 365,
- hosting the enterprise's database, e.g. EnterpriseDB,
- storage of files, e.g. Dropbox, Amazon S3,
- finance or accounting software,
- software application for managing information about customers – CRM,
- computing power to run the enterprise's own software, e.g. Amazon EC2.

Enterprises issuing or sending given types of invoices

The following types of invoices can be distinguished:

- eInvoices in a standard structure suitable for automated processing (e.g. EDI, XML systems),
- invoices in an electronic form not suitable for automated processing (e.g. e-mails, e-mail attachment as PDF, TIF, JPEG),
- invoices only in a paper form (no electronic counterpart).

Enterprises receiving orders for goods or services placed via a website or apps

Sales via websites includes orders placed by customers via an enterprise's website (online store, extranet, app) as well as orders received from customers via e-commerce platforms, auction services and related apps. Orders placed via manually types e-mails should be excluded.

Value of annual net sales from orders received via a website or apps

Expenditures on ICT incurred during a year

Types of ICT expenditures:

- fixed assets (including IT equipment, that is computers and peripheral devices, telecommunications equipment),
- financial leasing of ICT devices,
- software internally developed and for own needs or customisation of purchased software.

3.5. Organisation and management of the survey implementation

The Statistical Office in Szczecin constitutes an author team implementing the survey on ICT usage in enterprises. Employees of the Centre for Science, Technology, Innovation and Information Society Statistics, who are responsible for organisation of survey implementation and development, analysis and presentation of results, are a coordinating team. Its duties also include improving methodology of the survey and mainly adjusting it to the methodology of community surveys prepared by Eurostat. Therefore, it is necessary to co-operate with Eurostat and other Member States to define common subject matter of the survey, especially identifying and exploring new phenomena related to the dynamic development of information society. Main tasks of coordinators include:

- preparing assumptions for selection of frame and sample for the survey,
- verification of a survey file,
- preparing model questionnaires for the survey,

- preparing assumptions for logical and calculating control,
- preparing templates of result tables together with algorithms,
- preparing a survey schedule,
- assigning tasks related to implementing survey,
- supervision over the course of survey (i.a. on-going clarification of doubts reported by statisticians or reporting units),
- controlling errors in a dataset,
- analysing tables with actual and generalised data,
- approval of a national dataset,
- preparing templates and data for publication,
- preparing algorithms for computing data for Eurostat,
- verification of data computed for Eurostat,
- marking unreliable data and statistical confidentiality,
- on-going monitoring of issues related to the information society.

Survey coordinators co-operate with a team of programmers from the Centre for Data Engineering in the Statistical Office in Szczecin. The Centre supports processing of data collected from respondents and contributes to effective compilation and analysis of results. The tasks of the team from the Centre for Data Engineering include, i.a. developing Survey IT System and creating new functionalities which can streamline everyday work of statisticians and coordinators.

Statisticians, who are employees of branches of the Statistical Office in Szczecin, are responsible for direct contact with respondents, that is:

- Branch in Koszalin – for survey SSI-01,
- Branch in Stargard – for survey SSI-02.

Their tasks also include registering paper questionnaires in Survey IT System as well as sending paper based correspondence, that is sending reminders about a reporting obligation.

Implementation of the survey requires co-operation with other units of Statistics Poland:

- the Statistical Office in Łódź – responsible for preparing graphic layout of questionnaires, sampling and generalising survey results,
- the Statistical IT Centre – responsible for estimating precision of survey results, developing an application for all surveys on the Reporting Portal, supporting functionalities of the Reporting Portal (sending reminders to its users, e.g. about an imposed reporting obligation, impending date of fulfilling a reporting obligation).

3.6. Data presentation

Indicators collected from the enterprise survey are presented according to the following groupings:

- class of enterprise size;

size of an enterprise is determined on the basis of the number of persons employed. Three size classes can be distinguished:

- small enterprises – in which the number of persons employed amounts to 10–49,
- medium enterprises – in which the number of persons employed amounts to 50–249,
- large enterprises – in which the number of persons employed exceeds 249 persons,
- type of conducted economic activity; data published in a breakdown by sections, selected divisions, groups and classes on the basis of the Polish Classification of Activities (PKD 2007) coherent with the European classification NACE Rev.2,
- ownership form; national and foreign ownership can be distinguished on the basis of symbols used in the Statistical Units Database,
- territorial division.

Data are presented in accordance with an administrative division on a national and voivodship level as well as classification NUTS 2016 – on NUTS1 (macroregions) and NUTS2 (regions) levels.

It should be emphasised that results of enterprise surveys are published at the end of year in which the survey is conducted due to substantial information needs of users. News release Information society in Poland in . . . , which is published in October of a given year, is an announcement of “releasing data”. Detailed results are published in the publication Information society in Poland. Results of statistical surveys in the years (..), published in December, and result tables. Mentioned above publications are available on the website of Statistics Poland in a thematic area Science and technology. Information society <http://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/spoleczenstwo-informacyjne/> which also includes an archive with publications from the previous years. Results of enterprise surveys are published as well in:

- general publications:
 - Concise Statistical Yearbook of Poland,
 - Statistical Yearbook of the Republic of Poland,
 - Statistical Yearbook of Industry,
 - Statistical Yearbook of Voivodships,
 - Statistical Yearbook of . . . Voivodship,
- Internet databases:
 - Eurostat database <https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database>,
 - Local Data Bank <https://bdl.stat.gov.pl/BDL/dane/podgrup/temat>,
 - Strateg <https://strateg.stat.gov.pl/dashboard/#/obszary-tematyczne/12>,
- other commemorative publications, leaflets, etc.

3.7. Data evaluation – preliminary assessment of the survey quality and data reliability

Results of sample surveys are vitiated by sampling errors. As the number of observations increases, precision of the survey increases and, therefore, the certainty that results accurately describe the reality. When rare phenomena are analysed results turn out to be inaccurate due to the fact that they are generalised on the basis of a small number of cases. Standard error and coefficient of variation (CV) are the measures of these errors applied to results of the survey SS-01. Overcoverage errors, unit non-response and item non-response are the non-sampling errors which occur in both enterprise surveys. Overcoverage errors occur when there are entities in a survey file which are outside the survey scope or do not exist (e.g. liquidated entities, not removed from the frame). The share of such entities in a survey file does not exceed 1% of all entities in a file. Item non-responses concern auxiliary variables (number of persons employed, operating revenues). The share of entities with item non-responses for those two variables does not exceed 5% of all enterprises fulfilling their reporting obligation. Missing data are collected from other sources in order to minimise errors:

- number of persons employed – from the survey DG-1 or Statistical Units Database,
- operating revenues – from the surveys F-01/I-01, SP or using imputation of data.

The share of items for which imputation is applied does not exceed 1% of size of result dataset.

Completeness of the survey amounts to about 25%. The most common reason for unit non-response is refusal to take part in a survey explained by lack of time or reluctance caused by filling in a lengthy and incomprehensible questionnaire. The problem of respondent burden occurs also in other countries. Therefore, during meetings of task forces and working group on a European level, when new issues which will be included in surveys are defined, an effort is made to make questions clearly specified, definitions clear and answers do not take much time to prepare.

On a national level efforts are also made to make fulfilling a reporting obligation easier for respondents, i.a. by developing user-friendly, functional and personalised to the greatest extent electronic questionnaires. A personalised questionnaire is partially filled in with data collected from other questionnaires previously submitted by a respondent to avoid submitting the same information several times. Moreover, a respondent can contact a statistician who “leads” him/her through the whole process of fulfilling a reporting obligation if there are problems with filling in a questionnaire.

An electronic questionnaire is tested before it is available on the Reporting Portal. Testing consists in assessment of usefulness of an application and checking correctness of implemented validation rules ensuring logical and calculating control of data entered by a respondent. There are two types of rules:

- hard – determining requirements which a respondent has to fulfil to validate a questionnaire.
- soft – having the character of reminders, suggestions which do not have to be fulfilled to validate a questionnaire.

Validation rules are developed by a team of coordinators before preparation of an application. Due to a year-on-year changing objective scope of the survey, they have to be thoroughly verified before each subsequent edition because a properly functioning application is crucial for the process of collecting data of good quality.

Control of quality and accuracy of data takes place also after closing the Reporting Portal with the use of Survey IT System. It has functionalities enabling searching, filtering and generating reports. Thanks to them it is possible to analyse completeness and coherence of a dataset, detecting cases differing from assumed correct situation. Quick diagnosis of errors allows immediate implementation of corrective actions. Usually it is necessary to contact a respondent to receive explanations or make a correction in a report.

Definitions of the basic concepts used in surveys

Information society indicators.

3G, 3G+ – the 3rd generation mobile phone networks based on UMTS technology or its improvement (3+) HSDP. As opposed to the second generation networks (2G) built mainly to provide users with voice calls, 3G networks are designed to optimise data transfer.

4G, LTE – the 4th generation mobile phone networks, a successor of 3G networks. In comparison with the network of the previous generation, main advantages of this network include greater speed of data transfer and smaller delays. The network was designed to allow transfer of large amount of data, including streaming of video files.

ADSL (Asymmetric Digital Subscriber Line) – broadband digital technology allowing users to connect with a computer network, e.g. the Internet, enabling downloading data with speed faster than their uploading, that is asymmetrically.

Anti-virus, virus checking programme – a computer program used to detect and destroy computer viruses, currently frequently adopted to destroy other malware programs, e.g. spyware, trojan horses, rootkits.

Application – every stand-alone program or an element of software package which is not included in system software (an operating system). Examples of such software are: text processors, spreadsheets, programs for running databases, graphic design programs, programs for playing and editing multimedia, etc. Usually applications do not include computer games, however, from a technical point of view there are no differences between a game and any other program.

Audiobook – a sound recording including text of a book read out loud by a reader¹.

Automated data exchange – the process consisting in sending and/or receiving messages (e.g. orders, invoices, payments, product descriptions, transport documents and tax declarations) to/from external senders, e.g. enterprises, public administration, financial institutions.

BI (Business Intelligence) – a collection of practices, methodologies, tools and information technologies used to collect and integrate data to provide information and knowledge to the right persons in the right place at the right time².

Blog (weblog) – a journal, Internet diary – usually on a dedicated website on which an author makes dated entries³.

Broadband connection – a type of Internet connection characterised by high speed of information transfer measured in kb/s (kilobit per second), Mb/s (megabit per second) or Gb/s (gigabit per second). Due to fast technical advancement in telecommunications, determining cut-off bandwidth above which a given connection is considered broadband may become outdated shortly after adopting a definition. Therefore, broadband connections are defined on the basis of a type of Internet connection in the Community ICT surveys. According to such definition, broadband access is enabled by DSL technologies (ADSL, SDSL, etc.), cable TV networks (a cable modem), mobile phones operating at least 3G networks (UMTS, EDGE, etc.) and other, e.g. satellite connections, fixed wireless connections (a radio network). Broadband connections enable transferring high quality images, videos, watching TV or playing Internet games, making calls via the Internet with a possibility to see an interlocutor and allow using various advanced Internet services.

Catch-up TV – a form of video on demand; it allows watching already broadcast programmes by TV stations. These programmes are available for several days after their broadcast. This service can be made available via a decoder or on website of a broadcaster.

Cloud – storage space in the Internet (cloud computing) is a separate space where files, e.g. from a telephone, are sent. It means that every file uploaded to a folder is automatically copied to a server. A user has access to these resources regardless of a location, via any computer connected to the Internet⁴.

Computer network – a group of computers or other devices connected to exchange data or share various resources, for example:

Computer viruses – malware or fragments of a code which can “infect” other useful programs (“carriers”) to spread and attack other computers. In the less strict sense, all malware are called viruses.

1 <https://sjp.pl/audiobook> [access: 01.07.2019]

2 Methodological Manual for statistics on the Information Society, Eurostat, 2016.

3 <https://www.techopedia.com/definition/5207/web-log-blog> [access: 08.07.2019]

4 Methodological Manual for statistics on the Information Society – households, Eurostat, 2018.

Computer/video games – programs used for entertainment. Sometimes computer/video games are not included in software stating that elements of software, even though necessary for running a game, do not prejudice their utility values. According to such point of view, a storyline and aesthetic features are crucial in a game as in films.

CRM (Customer Relationship Management) – software used for managing relationships with customers.

Database – an ordered collection of information from a given field together with tools for collecting, transforming and searching it.

Desktop – a computer which, due to its size and weight, is intended for work in one place. A monitor, keyboard and other devices increasing its functionality (a mouse device, loudspeakers, etc.) are not usually integrated with a computer case.

DSL (Digital Subscriber Line) – a family of technologies enabling broadband connection to the Internet with the use of a traditional copper telephone cable (ADSL, SDSL).

e-book (electronic book) – text written in an electronic form, intended for display by appropriate software installed on a computer device (e.g. personal computer, e-book reader, mobile phone, palmtop).

EDI – electronic interchange of information, commercial or administrative data (invoices, bank transfers, orders) between organisations or enterprises.

e-health – are all applications of ICT in order to prevent diseases, diagnostics, treatment, follow-up or leading a healthy lifestyle. Such tools are used for communication between patients and service providers from the healthcare sector, transferring data between institutions and direct contact between patients as well as employees of healthcare. They may also include information networks related to health, electronic records, telemedicine services, mobile or wearable communication devices used to support a patient and monitor his/her condition⁵.

Electronic commerce, e-commerce – comprises transactions conducted via computer networks; in the case of natural persons – only via the Internet. Goods and services are ordered electronically but the payment and delivery of ordered goods or services can be done in any form (also off-line). Orders placed via telephone, fax and manually types e-mails (not processed automatically) are not included in e-commerce⁶.

Electronic document management system (EDMS) – IT system for electronic management of documents enabling carrying out clerical tasks, documenting handling of cases and collecting and creating electronic documents⁷.

Electronic invoice – a document used to carry out electronic transactions, including information concerning due payments⁸.

Electronic public administration – ICT usage by public administration, which together with organisational changes and acquiring new skills by persons employed is supposed to improve the quality of public services, strengthen involvement of citizens in democratic processes as well as support for state policies⁹.

e-mail – a service consisting in sending messages, including text with attachments, between owners of e-mail inboxes via the Internet or other computer networks¹⁰.

ERP (Enterprise Resource Planning) – software used to manage resources of a unit by disseminating information between different sections of a unit.

File – a collection of data on a computer disk or other storage medium (a memory card, pendrive, DVD, etc.). Contents of a file can include: a program, word processor documents, databases, spreadsheets, image, video, etc.

Firewall – a computer program or device (e.g. an appropriately configured router) used to protect a computer or the whole local network (e.g. home) from attacks from the Internet. Basic functions of firewall include:

Government administration – authorities performing administrative functions which are governed by the Council of Ministers¹¹.

5 <https://www.prawo.pl/zdrowie/ehealth,235380.html> [access: 08.07.2019]

6 Methodological Manual for statistics on the Information Society – households, Eurostat, 2018.

7 Regulation of the Council of Ministers of 18 January 2011 on office instructions, uniform material list of files and instruction regarding organisation of scope of activities of company archives (Journal of Laws 2011, No. 14, item. 67).

8 Methodological Manual for statistics on the Information Society – households, Eurostat, 2018.

9 A. Dąbrowska, M. Janoś-Kresło, A. Wódkowski, E-services and information society, Warsaw 2009, Difin, p. 47.

10 <http://staff.uz.zgora.pl/amajczak/sieci-komputerowe/PE.html> [access: 08.07.2019]

11 Constitution of the Republic of Poland article 146, item 3.

GSM (Global System for Mobile Communications) – currently the most popular mobile telephony standard in which both signal and speech channels are digital.

HSDPA (High Speed Downlink Packet Access) – technology speeding up downloading data in 3G (third generation) mobile phone networks which is an upgrade of UMTS technology. Together with HSUPA (High Speed Uplink Packet Access) technology, which enables faster upload of data, HSDPA is sometimes called 3G+ or “turbo 3G” network. It offers broadband mobile access to the Internet.

ICT – (Information and Communication Technologies) – a family of technologies processing, gathering and transferring information in an electronic form.

ICT products – products which process information and send it electronically as well as have a possibility of transmission and displaying.

ICT specialist – a person employed for whom work in the ICT field is the main task.

Instant messaging – a program used to exchange messages in the Internet. Such messages are delivered in short time intervals. Unlike e-mail, instant messaging not only delivers messages but also exchanges information about presence of users in the network, which allows treating exchange of messages as an ordinary conversation. Currently, instant messaging is used to exchange text messages, images, videos as well as make voice and video calls.

Internet – a global public computer network based on a communication protocol TCP/IP. It is a network that consists of millions of local networks and single computers worldwide. Such services are available within the Internet as www, e-mail, FTP, etc.

Internet banking – banking operations carried out by a customer via the Internet. This service may allow inspect the balance of a bank account and possibly receive general information about banking services or active carrying out of operations on bank accounts¹².

Internet of things (IoT) – is a concept that all computer devices, machines, buildings, animals and people have unique identifiers and have a possibility to collect and then transferred between them via the Internet. Currently, the main groups of IoT devices include:

- wearables, that is all elements of clothing, bands, watches, etc.
- smart home appliances – lightning, heating, monitoring, safety appliance and systems, etc.
- consumer electronics, e.g. fridges, ovens, coffee machines, scales, etc.

Internet services – services consisting in delivering directly to a recipient’s computer games, videos, music, computer programs and other products via the Internet as well as developing and maintaining enterprise websites, database apps and online stores, registering Internet domains, hosting including access to e-mail accounts and maintaining mentioned services on servers of an enterprise providing a service as well as advertisement and marketing in the Internet.

Intranet – an internal separated network of an enterprise based on solutions used in the Internet, that is the same standards, protocols and programs, covering all entities of an enterprise (office, establishments, branches).

Local self-government administration – public authorities set up to implement tasks of the state in the field. Commune, county and voivodship self-government are established under law associations of all inhabitants of a commune, county or voivodship which have a legal personality and implement tasks related to public administration¹³.

Logging – an identification procedure allowing determined users to get access to a computer, computer network or website, e.g. transaction service of an internet bank. Logging usually requires typing an identifier (login) and password¹⁴.

Malware – a collective name for various types of programs created to distort functioning of computers or other devices in computer networks, overtaking, stealing or destroying data or taking control over somebody’s computer remotely. Including a given program or code to malware is based on harmfulness of effects of its functioning, for example if a program for remote control of a computer is knowingly and intentionally installed by an authorised user to facilitate access to own resources – it is included in programs. However, if a similar program is installed without knowledge and consent of a user (e.g. as a result of attack of a computer virus) to steal confidential data or use a computer to attack other computers or a network, it will be

¹² Methodological Manual for statistics on the Information Society – households, Eurostat, 2018.

¹³ E. Ochendowski, Administrative law, Toruń 1999, Towarzystwo Naukowe Organizacji i Kierownictwa Dom Organizatora, p. 18-19.

¹⁴ <https://sjp.pwn.pl/szukaj/logowa%C4%87%20si%C4%99.html> [access: 09.07.2019]

included in malware. Modern malware is frequently a combination of a number of types, e.g. if a user opens a dangerous website and accidentally runs a trojan horse attacking a website, which enables downloading and running a virus used to infect specified files of an operating system, backdoor or spyware to take control over a computer and steal data and rootkit to hide activities of this malicious software.

Mobile access to the Internet – using portable devices connecting with the Internet via mobile telephony networks.

Netbook – a smaller and lighter version of a laptop which is in between a laptop and a handheld computer. Netbooks have wireless internet connections and standard ports allowing to connect typical peripheral devices (e.g. a mouse device, external drives, USB flash drives, printers, etc.) but do not have an in-built DVD drive. Their technical parameters are usually worse than in laptops and desktops. For the purpose of the survey, notebooks are included in portable computers (laptops).

Online – a mode of operation of a computer or other electronic device consisting in connecting with a computer network (e.g. the Internet). In the context of using services or ordering goods or services, it means – via the Internet, directly from a vendor and on an ongoing basis (during a connection).

Open Data – data generated by a public administration authority (or commissioned by it) which are available for every interested persons for using, processing and disseminating for any purpose.

Operating system – software managing computer equipment, creating environment to run and control all other programs (applications). Modern operating systems have many integrated applications increasing their functionality or enabling controlling a computer and programs thanks to conducting simple operations on screen with the use of a mouse device or other graphics devices facilitating communication with a user.

Optical fibre – a type of cable used to send signals in which light is the medium of information.

Personal computer, PC – a computer intended for one user. This term covers desktops and portable devices (laptops, netbooks) but does not include handheld devices such as handheld computers (palmtops, PDA).

Pharming – creating fake websites pretending safe websites of known institutions, e.g. a bank, where an unaware user provides important data such as username, password, which can be used for theft or fraud. Redirection to a fake website is automatic by changing settings of a browser by a malware program or script¹⁵.

Phishing – wangling important data such as a username or password, credit card data, ep.c. by sending e-mails from allegedly safe, known institutions (e.g. a bank, online store) with a request to transfer such data e.g. to confirm a transaction, unlock an account, etc. Such messages often contain a link to a fake website which looks alike a real website of a bank or other institution but was created and managed by fraudsters who obtain in this way information needed for theft or other crimes¹⁶.

Portable computer, laptop (sometimes called notebook) - a computer smaller and lighter than a desktop, with a keyboard and a monitor which are an integral part of it. It can run on a built-in battery or use an external power source. Laptops use the same operating systems, programs as desktops and can have the same technical parameters.

Portable device – a device enabling mobile or wireless access to the Internet (e.g. notebook, netbook, laptop, tablet, smartphone, PDA).

Public administration – activities overtaken by the state and implemented by its dependent authorities as well as authorities of local self-government consisting in meeting collective and individual needs of citizens resulting from coexistence of people in communities¹⁷.

Quality management system ISO 9000 – principles, procedures, methods, tools, descriptions of positions, people and relations between them, whose task is achieving determined quality goals¹⁸.

Router – a device functioning as a communication node in computer networks used to branch network connections and manage flow of data packages in the network. Routing is a process of directing flow of information in a computer network.

SDSL (Symmetric Digital Subscriber Line) – a broadband digital technology allowing a user to connect with the Internet, allowing uploading and downloading data with the same speed, that is symmetrically.

15 Methodological Manual for statistics on the Information Society – households, Eurostat, 2018.

16 Methodological Manual for statistics on the Information Society – households, Eurostat, 2018.

17 Adam Błaś, Jan Boć, Jan Jeżewski Public administration wyd. Kolonia Limited, Poznań, 2004.

18 https://mfiles.pl/pl/index.php/System_zarz%C4%85dzania_jako%C5%9Bci%C4%85

Smart TV – a TV set connected directly to the Internet.

Smartphone – mobile phones with an operating system (e.g. Android or iOS) combining functions of a mobile phone and a handheld computer. They usually have a touch screen. They allow users to use the Internet, including mobile apps¹⁹.

Smartwatch – a wearable device with a touch screen, with the size of a watch, with all functions of a traditional electronic watch. It has some functions of a smartphone such as displaying messages from a telephone, controlling its functions (e.g. taking calls, controlling a music player) and additional functions e.g. measuring heart rate or a number of taken steps.

Social network service – an Internet portal or a content-intensive website allowing making and maintaining social relationships with other users (e.g. acquaintances – Facebook, classmates – nk, persons with similar interests – Twitter, persons with similar professional interests – LinkedIn) or enabling exchange and presentation of multimedia content (images, music, videos – e.g. YouTube). Social network services usually allow creating a user profile (a set of publicly available information about a person) and offer many tools facilitating communication between users (chats, discussion forums and lists, blogs, instant messaging) or searching related information²⁰.

Software – all instructions and procedures (programs) and data linked with them allowing computers and other programmable devices to perform determined functions. Software is often understood as a synonym of a computer program, even though, it has broader meaning – it also covers programs used by other devices. Software includes operating programs, applications, software developing programs, programs controlling functioning of other devices (TV sets and other electronics, calculators, mobile phones, computer components, e.g. DVD recorders) – so-called firmware, as well as various programs used by devices and network or telecommunications systems, etc.

Spam – an unwanted message advertising a product or a service. An electronic version of “trash”. Traditional spam used to concern e-mail accounts, currently attacks in social media (e.g. Facebook), blogs or telephones are also common. Due to a substantial size, spam blocks an inbox and makes finding messages from acquaintances or other important correspondence more difficult. Including a given message in spam is based on a user’s opinion – spam is everything a given person does not want to receive²¹.

Spatial data – all data referring directly or indirectly to a given location or geographic area²².

Spreadsheet – a computer program used to carry out financial calculations, statistical compilations, etc. with the use of tables²³.

Tablet PC – a small portable computer with a touch screen and a screen keyboard. Bigger than a smartphone. Depending on a type, combining features of a smartphone and netbook to a smaller or bigger extent.

Text processors (advanced text editor) – a program enabling editing and formatting text as well as creating or pasting other objects to a document, e.g. tables or charts. Unlike simple text editors, a created document has to include information about way of displaying it and an image of a printed version.

Trojan horse, trojan code, trojan – a type of virus which pretends that it is useful or helpful but in reality damages a computer and steals data. Trojans often spread via infected e-mail attachments or downloading files. They hide in games, apps, films and greeting cards²⁴.

UMTS (Universal Mobile Telephone System) – 3rd generation data transmission technology in mobile phone networks. It enables sending sound and vision in real time (multimedia services) and ensure broadband access to the Internet via a mobile phone.

using a central database,

using shared devices, e.g. printers, scanners,

using shared software,

19 Methodological Manual for statistics on the Information Society – households, Eurostat, 2018.

20 Methodological Manual for statistics on the Information Society – households, Eurostat, 2018.

21 <https://www.avast.com/pl-pl/c-spam> [access: 09.07.2019]

22 Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (OJ L 108).

23 <https://sjp.pwn.pl/slowniki/arkusz%20kalkulacyjny.html> [access: 08.07.2019]

24 <https://www.avast.com/pl-pl/c-trojan> [access: 09.07.2019]

Video on Demand, VOD – a service enabling watching films, episodes of series, programs (also broadcast live) in selected time (later than broadcasting time).

Videoconference – telecommunications service consisting in using devices transmitting sound and images to hold a conversation (a conference) between interlocutors in different places.

Videoconversation – using a computer network, e.g. the Internet, to transmit sound from a microphone and image from an Internet camera to hold a conversation between two users of a given network with a possibility to see an interlocutor. Many Internet communicators, e.g. Skype, provide such possibilities to their users.

WCAG 2.0 on AA level – guidelines regarding accessibility of web content; a set of recommendations which should be followed to ensure access to web content to a possibly broad group of users, including persons with disabilities. AA level – commonly considered as an optimal level of accessibility; websites on AA level meet specific criteria which allow a broad group of users, e.g. persons with disabilities, to access them²⁵.

Website – a collection of documents (containing usually text as well as graphics, animations, etc.) in the Internet concerning a determined topic, covering an initial document, called a homepage, and usually documents related to it – another pages and hyperlinks to other websites. Websites are encoded in HTML language, read by programs called Internet browsers, e.g. Mozilla Firefox, Google Chrome, Microsoft Edge, Opera or Safari.

Wi-Fi (Wireless Fidelity) – a set of standards created to build wireless computer networks. A specific application of Wi-Fi is building local networks based on radio communication, that is WLAN (Wireless Local Area Network).

xDSL – a collective term for all DSL technologies, where x means various categories of DSL, e.g. ADSL, IDSL, HDSL, SDSL.

25 <http://wcag20.widzialni.org/standard-wcag,m,mg148>

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Annex

Table 1. The survey on ICT usage in households – questionnaire for households (SSI-10G)

Objective scope	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Household characteristics	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Expenditures on ICT and household characteristics ^a				x	x	x	x	x	x	x	x	x	x	x	x
Access to ICT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
ICT usage by children ^a									x			x			
Carrying out an interview	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

a A module added for national needs.
Source: own study.

Table 2. The survey on ICT usage in households – questionnaire for individuals (SSI-10I)

Objective scope	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Use of computers	x		x	x	x	x	x			x	x	x	x	x	x
Use of computers and mobile phones		x						x	x						
Use of the Internet	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Purpose of using the Internet ^a	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Using advanced services available over the Internet or mobile phone networks				x											
Mobile use of the Internet and ubiquitous connectivity								x							
Internet security	x					x					x				x
Use of e-Government		x				x	x	x	x	x	x	x	x	x	x
Internet commerce details	x	x													
Use of e-Commerce			x	x	x	x	x	x	x	x	x	x	x	x	x
E-Skills	x	x	x			x	x	x	x	x	x	x	x	x	x
E-health (using the Internet in health-related issues) ^b								x			x				
Use of cloud computing										x	x	x	x	x	x
Use of advanced ICT ^b										x			x		
Privacy and protection of personal identity												x			
Trust, security and privacy															x
ICT at work															x
Digital skills															x
Use of mobile phones ^b															x
Background characteristics		x	x	x	x	x	x	x	x	x	x	x	x	x	x
Carrying out an interview	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

a In the years 2006-2018 questions from a module "Purpose of using the Internet" were included in a module "Use of the Internet".

b A module added for national needs.
Source: own study.

Table 3. The survey on ICT usage in enterprises (SSI-01)

Objective scope	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
General information about ICT systems	x														
General information about ICT systems		x	x												
Use of computers and computer networks				x	x	x	x	x	x	x	x	x	x	x	x
Use of the Internet		x	x												
Use of the Internet and ensuring security	x														
Access and use of the Internet				x	x	x	x	x	x	x	x	x	x	x	x
Use of a fixed broadband connection to the Internet for business purposes										x	x	x	x	x	x
Mobile access to the Internet								x	x	x	x	x	x	x	x
ICT skills			x						x						
E-skills and ICT specialists										x	x	x	x	x	x
Benefits of the use of ICT				x											
Handel elektroniczny (poprzez sieci komputerowe)				x	x	x	x	x	x	x	x	x	x	x	x
E-government	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Website	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
E-commerce via the Internet	x	x	x												
E-commerce via external computer networks other than Internet		x	x												
Barriers limiting Internet sales	x														
Electronic invoicing							x		x	x	x	x	x	x	x
Automated data exchange				x	x	x	x	x		x			x		
Sharing Supply Chain Management Information electronically				x	x	x		x		x	x		x		
Sharing of information electronically within the enterprise				x	x	x	x	x	x	x	x		x		x
Use of Radio Frequency Identification (RFID) technologies					x		x			x			x		
Use of cloud computing services										x	x	x	x	x	x
ICT security						x					x				x
ICT and environmental impact							x								
Use of social media									x	x	x	x	x	x	x
Big data analysis												x	x	x	
ICT expenditures						x	x	x	x	x	x	x	x	x	x
Use of 3D printing technologies														x	x
Use of robotics														x	x
Open public data														x	x

Source: own study.

Table 4. Survey on ICT usage in financial sector enterprises (SSI-01)

Zakres przedmiotowy	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
General information about ICT systems	x													
General information about ICT systems		x	x											
Use of computers and computer networks				x	x	x	x	x	x	x	x	x	x	x
Use of the Internet		x	x											
Use of the Internet and ensuring security	x													
Access and use of the Internet				x	x	x	x	x	x	x	x	x	x	x
Use of a fixed broadband connection to the Internet for business purposes										x	x	x	x	x
Mobile access to the Internet								x	x	x	x	x	x	x
Use of computer-mediated networks other than the Internet	x													
Services offered by an enterprise (including over the Internet)	x													
Benefits to Internet sales	x													
Barriers to Internet sales	x													
ICT skills			x						x					
E-skills and ICT specialists										x	x	x	x	x
Benefits of the use of ICT				x										
E-Government	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Website	x	x	x	x	x	x	x	x	x	x	x	x	x	x
E-commerce via the Internet		x												
E-commerce via external computer networks other than Internet		x												
Electronic invoicing							x		x	x	x	x	x	x
Automated data exchange				x	x	x	x	x		x			x	
Sharing Supply Chain Management Information electronically				x	x	x							x	
Sharing of information electronically within the enterprise				x	x	x	x	x	x	x	x		x	
Use of Radio Frequency Identification (RFID) technologies					x		x			x			x	
Use of cloud computing services										x	x	x	x	x
ICT security						x					x			
ICT and environmental impact							x							
Use of social media									x	x	x	x	x	x
Big data analysis												x	x	x
ICT expenditures						x	x	x	x	x	x	x	x	x
Open public data														x

Source: own study.