



Appendix I R&D 2021 in Business Enterprises

Instructions on how to fill out the questionnaire

I. General

Please bear in mind the following points when filling in the questionnaire:

- **Refer to the definitions and explanations given in the appendices.**
- **Do not leave any fields blank and indicate absence of expenditure or people by “0” (nil). If it is difficult for you to answer, please give the best estimation possible.**
- **If you are unable to break down your information to the level of detail requested, please at least give estimation for the total.**
- **Amounts should be rounded to thousands of Swiss francs. Percentages should be rounded up or down to the nearest whole number.**
- **All information regarding R&D refers to the calendar year 2021 or to the fiscal period mainly covered by the calendar year 2021.**

II. Definition and delimitation of Research and Development (R&D)

Definition of Research and Development (R&D)

Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.

In particular, Research and Development includes:

- Development project planning and guidance (research management);
- Manufacture and testing of prototypes and further development leading up to production. However, this does not include the construction of production facilities;
- Building and running of pilot plants as long as these facilities are not used for normal production;
- clinical trials, phases 1, 2, and 3;
- **Completion of projects based on new discoveries and scientific and/or technological progress and intended to clarify uncertainties.**

Research and Development does not include:

- Trial runs, facilities and investment costs to bring the product or service to market;
- Training and continued training of employees;
- Documentation and bibliographical work (not directly related to R&D);
- Periodical scientific services such as data pools, measurement taking, compiling of statistics, testing, routine quality control and production inspection;
- Development of standards;
- Administrative tasks relating to patent and license applications;
- Technical, scientific and administrative consulting;
- Production of goods (including trial runs), provision of services and quality checks;
- Technical sales support, microeconomic studies;
- Marketing research and feasibility studies (when not directly related to R&D projects);
- Routine activities, inspections and continuous improvements;
- Use of pre-existing methodologies and knowledge;
- **All activities that have nothing to do with research nor are part of a research project.**

III. Explanations regarding the sections of the questionnaire

Section 0: Questions about the business in Switzerland

Please fill in the questionnaire for the whole of your business.

If the information that you can provide also concerns some of your affiliated businesses in Switzerland, we kindly ask you to send us a list of **all the affiliated businesses** of your group in Switzerland that carry out R&D and on whose behalf you are replying in the questionnaire.

Business	The business is the smallest combination of legal units that form an organisational production unit of goods and services and which has some independence in its decision-making. A business carries out its activity in one or several establishments.
Establishment	The establishment is a business or part of a business (workshop, factory, shop, office or warehouse) situated at an identified geographic site. At or from this site, economic activities are carried out, for which, without exception, one or several persons work on behalf of the same business.
Affiliated business	Business belonging to a group of businesses and whose parent company holds more than 50% of assets. A group of businesses comprises at least two businesses situated in the country or in a different country.

Section 1: Intramural expenditure on R&D by the business in Switzerland in 2021

Intramural expenditure on R&D refers to all R&D activities carried out by the business (including its workplaces and subsidiaries) on its own premises (laboratories) in Switzerland, irrespective of how this R&D was funded. Intramural R&D expenditure is broken down as follows:

R&D personnel expenditure	R&D personnel expenditure includes wages & salaries as well as related R&D personnel costs and benefits such as bonuses, holiday pay, employer contributions to retirement plan and other Social Security contributions (gross amounts) paid to internal R&D personnel (see definition in section 6/7).
Other current R&D expenditure	Other current R&D expenditure covers, with the exception of amortisation, all expenditure arising for rent, leasing, purchase of materials, supplies and various equipment which enable R&D to be performed and which are not part of the capital expenditure on R&D (R&D investments). It also covers wages and related costs paid to external R&D personnel (consultants and temporary personnel).
R&D investment expenditure	R&D investment expenditure (capital expenditure on R&D) cover expenditure for the acquisition of property and building appliances, heavy equipment used for R&D activities. The investments also include the purchase of software for the performance of R&D. If acquisitions are not devoted entirely to R&D purposes, please give a rough percentage estimate of how much of the usage is R&D-related.

Section 2: Use of R&D result by the business in Switzerland in 2021

See **Appendix II** for definitions of branch (es) of economic activity in which results of R&D performed by the business are used.

Section 3: Distribution of intramural expenditure on R&D by the business in Switzerland in 2021

3.1 Intramural expenditure on R&D by technology

See **Appendix III** for definitions and examples of R&D in biotechnology, nanotechnology and software.

3.2 Intramural expenditure on R&D by type of R&D

Basic research	Basic research consists of experimental and theoretical work undertaken primarily to acquire new knowledge of the underlying causes of phenomena and observable facts without a specific application in view.
Applied research	Applied research consists of original work undertaken in order to acquire new knowledge with a specific application or objective in view.
Experimental development	Experimental development consists of systematic work using existing knowledge gained from research or practical experience for the purpose of creating new or improved materials, products, processes, systems or services, including design and development of prototypes and methods.
Example: Chemistry	Basic research in the field of chemistry would entail research relating to specific types of polymerisation reactions under various conditions, the polymer products resulting from those reactions and the corresponding chemical/physical properties. Applied research would entail attempts to use these reactions to optimise production of a polymer substance having given physical or mechanical properties. Experimental development would entail research and assessment of various approaches that would enable laboratory-optimised production processes to be used to produce the polymer substance as well as finished goods made from that substance.

Example: Electronics **Basic research** in the field of electronics would entail research relating to the use of various crystals to absorb electromagnetic radiation in order to better understand the radiation's electron band structure. **Applied research** would entail observation of the absorption of electromagnetic radiation by a given set of crystals under various conditions in order to determine which crystals exhibit specific radiation detection properties. **Experimental development** would entail the creation of an enhanced radiation detection device that makes use of the chosen crystal.

Example: Metallurgy **Basic research** in the field of metallurgy would entail the creation of a new alloy whose properties are not initially known. **Applied research** would entail observation of the behaviour of the new alloy under various conditions in an engine. **Experimental development** would entail the creation of a prototype engine based on the results obtained from applied research.

3.3 Intramural expenditure on R&D by R&D objective

Intramural R&D expenditure (point 245, section 1) is broken down according to these objectives.

Although projects are usually attributed to a single category in the list of objectives, businesses may assign several objectives to a single project. In such cases, the category chosen should correspond to the main objective of the project.

For example, item "Energy" would be considered as the main objective of heat pump research, not item "Industrial production and technology".

See **Appendix IV** for a detailed list of R&D objectives.

Section 4: Funding of intramural R&D carried out by the business in Switzerland in 2021

Funding originating in the business itself An amount that the business draws from its own resources to ensure its R&D. This includes funds (e.g. shares, bonds) raised on the financial market and bank loans.

R&D contracts The business is entrusted with R&D contracts by external bodies to perform R&D for which it is paid. The contracts are usually governed by a private law contract. The contract awarder has a direct interest in using the results of outsourced research to further its own activities. Moreover, the business can supervise and monitor the outsourced research as it progresses.

R&D grants R&D grants are financial resources given to the business as non-recoverable grants, to encourage R&D activities. In most cases, the grant awarder does not have a direct stake in the research conducted by grant recipients and research funding is either awarded or made available. Grant recipients are required to use the funds only for the purposes of the research for which the grant was awarded. As a general rule, the financial backer has no influence on the evolution of the R&D project. Financial resources given to the business as non-recoverable grants, to encourage R&D activities.

Section 5: Extramural expenditure on R&D by the business in 2021

Business expenditure for extramural R&D includes all R&D activities that the business has outsourced to third parties in Switzerland or abroad, whether in the form of contracts or grants. For the definition of "R&D contracts" and "R&D grants" see **section 4**.

Sections 6 and 7: Internal R&D personnel of the business in Switzerland in 2021

Internal R&D personnel Internal R&D personnel includes all persons working in the enterprise (whether employees or not), who participate directly in intramural R&D projects or who carry out the management of R&D grants awarded by the enterprise to third parties. Internal personnel who spend only a part of their time on R&D or who participate in short-term R&D projects are also included.

Internal R&D personnel sometimes receive back-up from external R&D personnel.

External R&D personnel are not included in the survey. Data on external R&D personnel are not collected in this questionnaire.

External R&D personnel External R&D personnel includes R&D consultants (whether self-employed or not), hired as back-up to carry out intramural R&D projects for the enterprise during the year for which the survey is conducted. Temporary personnel, active in R&D, are also included in external R&D staff.

Internal R&D personnel is surveyed in "number of persons" and in "full-time equivalents".

R&D full-time equivalents (FTE) The 4th column represents the total amount of working time devoted to R&D by internal personnel in 2021. One full-time equivalence on R&D is the equivalent of one R&D employee working full-time for one year. Full-time equivalence on R&D is calculated by taking the type of workweek (full-time or part-time %), the duration of employment, and the portion of time devoted to R&D and multiplying these figures together.

Example

University graduates	Type of workweek 2021	Duration of employment 2021	Proportion of time devoted to R&D	Full-time equivalence on R&D (FTE)
1 Mathematician	Full-time	12 months	60%	1.0 X 1.0 X 0.6 = 0.6 FTE
1 Engineer	60%	6 months	100%	0.6 X 0.5 X 1.0 = 0.3 FTE
1 Lawyer	80%	10 months	30%	0.8 X 0.8 X 0.3 = 0.2 FTE

3 university graduates
(= point 640, column 1)

in full-time equivalence = 1.1 FTE
(= point 640, column 4)

Sections 6: *Internal R&D personnel of the business in Switzerland in 2021, by qualification*

Internal R&D personnel (see definition in section 6/7) are considered here by **qualification**.

Qualification (highest level completed)

Tertiary level, universities This category covers people who completed tertiary level education at a higher education institution. This includes graduates from universities (UH), federal institutes of technology (ETH), universities of applied sciences (FH) and universities of teacher education (PH).

of which PhD, doctorate or equivalent title This category covers persons who have completed university education with a PhD, doctorate or equivalent title.

Tertiary level, higher vocational education This category includes all employees who obtained a degree in the fields of engineering, economics, computer science, gastronomy, etc. from today's technical colleges (i.e. institutions created following reform of the Swiss higher education system). This category also includes employees who obtained a Swiss federal diploma (e.g. Master's), a Swiss federal advanced certificate or received another form of advanced vocational training. Finally, this category also includes employees who obtained a degree from the former technical colleges (i.e. institutions existing prior to reform of the Swiss higher education system): Höhere Technische Lehranstalt (HTL), Höhere Wirtschafts- und Verwaltungsschule (HWW), Höhere Fachschule für Gestaltung (HFG) and Höhere Fachschule für Soziales (HFS).

Other qualifications This category includes people with no tertiary qualification as well as people whose education is not specified.

Section 7: *Internal R&D personnel of the business in Switzerland in 2021, by function*

Internal R&D personnel (see definition in section 6/7) are considered here by **function**.

Function

Researchers Researchers are specialists who devote themselves to research. They make new discoveries and design or develop products, procedures, methods and systems. This category also includes scientists who administer R&D projects or coordinate the scientific and technical aspects of R&D work or who carry out the management of R&D grants awarded by the enterprise to third parties.

R&D technicians R&D technicians are in charge of scientific, technical and laboratory work, normally under the supervision of a researcher.

R&D supporting personnel (or not specified) R&D supporting personnel includes administrative employees and other office workers who take part or are directly involved in R&D projects. This category also includes managers and senior managers who are mainly involved in the financial, personnel-related and general administrative aspects of R&D and lend direct support to R&D activities.

Section 8: *Information on affiliated businesses abroad in 2021*

Total number of persons employed abroad This is the number of persons employed (and not jobs!) in affiliated businesses abroad as at 31.12.2021 (full and part-time employees).

Total intramural expenditure on R&D abroad Total R&D expenditure by affiliated businesses abroad, for R&D work performed at their own premises.

Total number of internal R&D personnel abroad Number of persons directly allocated to R&D, including management staff whose work is directly linked to R&D work or contracts and grants in the affiliated businesses abroad.

Thank you for having taken part in this survey!

For questions, please contact the FSO **0800 20 10 10** (free number) or email: mon.rd@bfs.admin.ch.