

3. Definition of research and experimental development (R&D)

The HERDC definition of *research and experimental development*, abbreviated as R&D, is consistent with the OECD definition of research and experimental development set out in the 2015 Frascati Manual. R&D is defined as:

'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 knowledge².'

For an activity to be an R&D activity it must satisfy all five core criteria:

- 1 to be aimed at new findings (novel),
- 2 to be based on original, not obvious, concepts and hypotheses (creative),
- 3 to be uncertain about the final outcomes (uncertain),
- 4 to be planned and budgeted (systematic), and
- 5 to lead to results that could be possibly reproduced (transferable and/or reproducible)³.

The above definition encompasses pure and oriented basic research, applied research and experimental development, defined as follows:

- *Basic research* is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.
 - *Pure basic research* is carried out for the advancement of knowledge, without seeking economic or social benefits or making an active effort to apply the results to practical problems or to transfer the results to sectors responsible for their application.
 - *Oriented basic research* is carried out with the expectation that it will produce a broad base of knowledge likely to form the basis of the solution to recognised or expected current or future problems or possibilities.
- *Applied Research* is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective (including a client-driven purpose).
- *Experimental development* is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.

Activities that meet the above definition of R&D include:

- a) professional, technical, administrative or clerical support staff directly engaged in activities essential to the conduct of R&D
- b) the activities of HDR⁴ students enrolled at the HEP
- c) the development of HDR training and courses
- d) the supervision of HDR students enrolled at the HEP
- e) R&D into applications software, new programming languages and new operating systems

² OECD (2015), *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, pp 44-45.

³ *Ibid.* pp 46-48.

⁴ Higher degree by research (HDR) training is training undertaken by students to achieve a Research Doctorate or Research Masters. A Research Doctorate means a Level 10 Doctoral Degree (Research) qualification as described in the Australian Qualifications Framework and a Research Masters means a Level 9 Masters Degree (Research) qualification as described in the Australian Qualifications Framework. Professional Doctorates may be included but only where at least two-thirds of the qualification is research.

- f) prototype development and testing
- g) construction and operation of a pilot plant where the primary objective is to make further improvements
- h) trial production where there is full scale testing and subsequent further design and engineering
- i) phases I to III of clinical trials.

Activities that do not meet the definition of R&D include:

- a) scientific and technical information services,
- b) general purpose or routine data collection,
- c) standardisation and routine testing
- d) feasibility studies (except into R&D projects)
- e) specialised, routine medical care
- f) literature reviews that are predominantly a summary of the current knowledge and findings of a particular R&D field or topic and do not include any critical assessment or report any new findings or original experimental work
- g) commercial, legal and administrative aspects of patenting, plant breeders rights, copyright, material transfer agreements or intellectual property licensing, option and assignment activities, and royalties
- h) routine computer programming, systems work or software maintenance
- i) stages of product development that do not meet the five R&D criteria above⁵
- j) pre-production development⁶
- k) market research
- l) construction of fully tested prototypes for marketing purposes
- m) after sales service and trouble-shooting
- n) industrial engineering and design for production purposes
- o) artistic performance or expression
- p) R&D financing and support services.

⁵ OECD (2015), *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, pp 53-54

⁶ *Ibid.* p 54