Inland Revenue

R&D tax credits:

responses to 'Defining Innovation' and Government proposals

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1 Summary and introduction

Improving the UK's level of innovation is a key component in the Government's strategy for improving UK productivity and competitiveness. One of the major steps taken to boost innovation and promote research and development was the introduction of R&D tax credits.

EXECUTIVE SUMMARY

1.1 HM Treasury, DTI and Inland Revenue published, in July 2003, a consultation document 'Defining Innovation' aimed at identifying how the R&D definition and qualifying costs could be improved to better support R&D. A clear message from the 76 respondents was that they want more clarity and certainty in the R&D definition and the qualifying costs.

1.2 **New draft Guidelines defining R&D, prepared by DTI and intended to replace the current Guidelines, are at Appendix A1**. The guidelines are clearer and easier to navigate. They replace the current requirements for novelty and innovation with the need to show an 'advance in technology or science'. They are particularly aimed at making it clearer that development work is R&D where that work represents an advance in technology or science.

1.3 Paragraphs 2.13 to 2.16 below set out the Government's intentions in relation to a new category of qualifying costs to replace the current 'consumable stores'. The new category is intended to cover the key (non-labour) direct costs attributable to R&D, and to ensure companies are certain before the R&D commences precisely which costs qualify for the credit. It will include:

- materials consumed or transformed during the R&D
- water and fuel (including gas and electricity) consumed during the R&D
- software which is used directly and actively in the R&D

1.4 In addition, the Government will continue discussions with business to understand whether any direct costs are outside the change currently proposed and how any such costs might be brought within the schemes while minimising compliance burdens and cost effectively supporting R&D.

1.5 Other changes to the R&D tax credit schemes raised by respondents are discussed in Chapter 3 along with a number of improvements not raised in the consultation document.

INTRODUCTION

1.6 R&D tax credits were introduced initially for SME companies in 2000 and extended to all companies in 2002. In the same year the DTI, Inland Revenue and Treasury jointly undertook a series of roadshows both to publicise the credits and speak directly to businesses about the operation of the tax credit schemes and where they could be improved.

1.7 The latest take up figures for the SME R&D tax credit scheme show it is exceeding the Government's expectations. Over 8,000 claims have been received under the scheme so far providing support of over £500 million. This is a major boost to the UK's most innovative companies. For 2001-02, the latest year for which full figures are available, over 3,200 claims for R&D carried out during the year have been received, comprising support of more than £200 million. Take up and claims continue to increase. Around 3,000 claims have been received so far for R&D performed in 2002-03, indicating that innovative SMEs will receive even more support than in 2001-02.

1.8 In July 2003 the Government launched a consultation, *Defining innovation: a consultation on the definition of R&D for tax purposes*, which sought to explore how the definition of R&D could be rewritten to bring out the key factors whilst providing greater clarity and certainty. In addition, views were sought on the effectiveness of the 'consumable stores' definition, how 'bought in, advanced software' could be appropriately defined and the most appropriate way of categorising 'qualifying bodies'.

1.9 The Government received 76 written responses to the consultation document, from a wide range of those interested in research and development. These included individuals, companies, academics and representative bodies. In addition, a number of meetings were held with representative groups to explore particular issues of interest in greater depth.

1.10 The respondents gave strong support for the R&D tax credits schemes and provided valuable insight into where companies and their advisers were finding difficulty with the definition and how it might be improved. This document sets out the Government's response to the consultation process.

2 'Defining Innovation' summary of responses and Government proposals

This chapter sets out the questions posed in the 'Defining Innovation' consultation, gives a flavour of the responses and outlines how the Government proposes to develop the R&D tax credit schemes as a result.

Chapter 2 Innovation and R&D tax credits

2.1 Chapter 2 of 'Defining Innovation' covered particular issues for SMEs in the R&D definition and asked about any factors which may be adding unnecessary complexity to the scheme.

2.2 The responses were almost unanimous in rejecting differing definitions of R&D for SMEs and other companies. Such an approach would be contrary to respondents' general desire for clarity and simplicity. It is therefore proposed to **continue the current approach of a single definition of R&D governing both the SME and large company schemes.**

2.3 Two ways of simplifying the schemes were frequently referred to. Firstly respondents felt more guidance on the level of documentation which is needed to support a claim would be helpful. It is intended that **Inland Revenue will publish guidance in support of the revised R&D definition**. This guidance will discuss information requirements. Secondly a number of respondents took the view that specialist Inland Revenue staff trained in science and technology should support tax inspectors. It is proposed to keep this issue under review as it is expected the new Guidelines will resolve many of the uncertainties experienced previously.

Chapter 3 Towards a revised R&D definition

2.4 Chapter 3 discussed how the UK's definition of R&D compares internationally, how it might be revised and how better to ensure design as part of the R&D process is more fully reflected. It also asked how R&D in software ought to be reflected in a revised definition.

2.5 It was generally considered that the UK definition of R&D is broadly comparable with that of other jurisdictions, particularly given that many are based on the definition contained in the *Frascati* manual[1]. It was in responses to this Chapter that respondents most forcefully made the point that improved clarity in the R&D definition is urgently needed.

2.6 **Reproduced at Appendix A1 is a draft of new Guidelines defining R&D** which (once in their final form) are intended to replace the current DTI Guidelines of 28 July 2000. They have today been published by the DTI at www.dti.gov.uk/support/draft_guidelines.htm. The revised Guidelines neither widen nor narrow the scope of the current definition but they:

[1] OECD Frascati Manual 2002 Proposed Standard Practice for Surveys on Research and Experimental Development ISBN 92-64-19903-9

- are clearer and easier to navigate
- help give innovative companies confidence in advance that their work will attract the tax credits
- replace the current requirements for 'novelty' and 'innovation' with the need to show an 'advance in science or technology'
- are particularly aimed at making it clearer that development work is R&D where that work represents an advance in science or technology, including process development as well as the creation of new or improved products, services, materials and devices

2.7 Most respondents did not identify any particular problem with the current Guidelines in ensuring design is recognised as part of the R&D process. A majority of respondents (particularly those in the sector) favoured the removal of software-specific terms from the guidelines. A number preferred a core definition (without reference to particular sectors) and separate sector-specific guidance, discussed below at paragraph 2.12. **The draft Guidelines at Appendix A1 therefore do not explicitly refer to software (or to any other specific branch of technology).**

The boundary between R&D and related activities

2.8 Chapter 4 of 'Defining Innovation' focussed in detail on the DTI Guidelines and the current requirements for 'novelty', 'innovation' and 'substantial improvement'. It asked how these concepts might better be communicated in the Guidelines, and how companies might prove them. It also asked whether a statement of the commercial development activities which do not qualify would help to clarify the boundaries of R&D. Finally it asked whether respondents would like to see sectoral or technology-specific guidance.

2.9 A significant number of respondents believed that tests of 'novelty' and 'substantial improvement' are too subjective. It was suggested that the definition of R&D would be more objective, and thus easier for companies and the Inland Revenue to work with, if it were to focus more on whether the change represents a scientific or technological advancement.

2.10 **The new Guidelines implement a more objective approach.** The key test in the new Guidelines is whether the project seeks to achieve an advance in science or technology. This change makes the UK approach more consistent with other jurisdictions. How companies might prove the project is seeking to achieve an advance in science or technology will be discussed in the Inland Revenue's forthcoming guidance referred to at paragraph 2.3.

2.11 There was some support for defining the exclusions from R&D more explicitly. However many felt the emphasis should remain on positive inclusions. **The new guidelines are clearer** and it should therefore be easier to ascertain where R&D stops without the need for specific exclusions.

2.12 There was strong backing for sector-specific or technology-specific guidance, supported by a simpler core definition of R&D. The draft Guidelines at Appendix A1 reflect this desire for a simpler core definition. The Inland Revenue will be preparing guidance on the practical operation of the R&D tax credits, covering the eligible costs and the practicalities of making a claim. **It is proposed to keep the need for sector-**

specific guidance under review as part of the development of this guidance to ascertain how best to provide certainty, taking into account the fact that many respondents have offered to assist by working with Government to draft such guidance.

Consumable stores

2.13 As well as staffing costs, the other area of current expenditure that presently qualifies for R&D tax credits is that of 'consumable stores'. Consumable stores is defined by reference to accounting practice. Chapter 5 of the consultation asked whether this link to accountancy should be retained. It also asked what types of costs should be included in any revised category of consumable stores. Finally it was asked whether the costs of materials used in the construction of prototypes should qualify for the credit.

2.14 Respondents suggested the link to accountancy in the definition of consumable stores is not an effective aid to interpretation. **It is intended to remove the link with accountancy and introduce a statutory definition.** Many respondents highlighted the inconsistencies caused by the use of 'consumable stores', particularly in the areas of utilities and other items which, although consumed, may not be stored. **The new statutory definition will ensure**

- **materials consumed or transformed, and**
- **water and fuel (including electricity and gas)**

which are employed directly in the R&D will qualify for the tax credit.

2.15 As the requirement for an item to be stored will be removed, **specially commissioned parts for prototypes will be within the new definition of qualifying costs**.

2.16 Some respondents suggested that 'all costs directly attributable to the R&D activity' should qualify for the tax credit. However further detail was not generally given by respondents. It may be uncertain where the boundaries of 'direct costs' would lie, which could increase the complexity of the schemes, and compliance costs. **The Government will continue its dialogue with business on R&D tax credits to understand whether any direct costs are outside the change proposed at paragraph 2.14 and 2.18 and how any such costs might be brought within the schemes while minimising compliance burdens and cost effectively supporting R&D**. Any persons who wish to express views on this issue should send them to:

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Licenses for advanced software

2.17 The Chancellor committed in Budget 2003 to introduce licences for bought-in advanced software as a qualifying cost, subject to devising an adequate definition of such software. Chapter 6 sought to define such software by asking how close to the R&D the software should be to qualify. It also asked how 'advanced' might be defined and whether this could be done by reference to time or use limited software.

2.18 Respondents supported the inclusion of advanced software as a qualifying cost. They took the view that it would not be possible to define such software by reference to how many times it is used, or how long its licence lasts given the wide variety of software. Many respondents made the point that it should not be the nature of the software (i.e. whether advanced or not), but rather whether it is used directly in the R&D, which should govern whether it attracts the tax credit. In the light of these representations **it is intended to introduce a simple definition of bought-in software as a new qualifying cost**. **There will be no requirement that the software is 'advanced'. Instead it will be the purpose and use of the software which will determine whether it qualifies as a cost which attracts the R&D tax credit.**

Sub-contracted work and qualifying bodies

2.19 Under the large company scheme, companies cannot claim the tax credit where they contract R&D out to others. This gives rise to anomalies if the sub-contractor cannot claim the credit either. Specific provision is already made for this in the legislation which allows large companies to claim for work sub-contracted to universities, health service bodies, individuals, or other 'qualifying bodies' which cannot themselves claim. The consultation asked whether bodies other than those already listed are used, and if so, how such qualifying bodies can be defined.

2.20 Respondents confirmed that qualifying bodies other than those currently listed are used, most commonly overseas universities. However respondents were evenly split on how such bodies should be defined with some opting for an Inland Revenue maintained list and others preferring a generic definition.

2.21 If the approach of an Inland Revenue maintained list were to be adopted, it would still be necessary to devise a generic definition so that potential bodies to be listed could make a listing application. **It is therefore proposed to set out a generic definition so that companies may themselves assess whether bodies they are sub-contracting to fall within the definition**. **This generic definition will aim to encompass bodies which are collectively termed 'Public Sector Research Establishments'.**

3 Other issues

A number of respondents took the opportunity of the 'Defining Innovation' consultation to comment on issues which were not raised specifically in the consultation. These are discussed in this Chapter.

Also proposed are some minor changes to the tax credit schemes which were not raised in the 'Defining Innovation' consultation document.

Other issues raised by respondents

3.1 A rise in the SME and large company rates was requested by some respondents as it was suggested the current level of credit may have little impact on decision makers and thus not affect the level of R&D undertaken. However others said the tax credit, particularly the payable credit for loss making SMEs, had already been a vital support for R&D. For example one company pointed out how the payable credit had allowed it to factor into its initial funding projections two months' extra 'burn' and how this extra time can make the difference between success and failure. The fact that support provided under the schemes has been in excess of the Government's estimates is also a measure of its success. In view of these successes, and the extension of the categories of qualifying costs which will increase the financial support for R&D, it is not proposed to increase the rates of R&D tax credit at this time.

3.2 A small number of respondents argued strongly for an extension of the R&D tax credit to all commercial development, whether innovative or not. It was argued this would ease compliance burdens and encourage bringing new products and services all the way to market. Some suggested the rate of credit should be reduced to finance this change. It is considered a rate reduction at this time would not further the policy of encouraging more R&D. Similarly, although it is desirable to encourage the successful translation of ideas into marketable products and services, it is considered the most efficient way of achieving this is through support for resolving the riskiest part of the development cycle, i.e. where the technological uncertainties remain. It is therefore not proposed to reduce the rate or extend the definition of R&D beyond its current support aimed at advances in science or technology.

3.3 An extension of the schemes to partnerships (including Limited Liability Partnerships) and sole traders was raised by some respondents. Partnerships and sole traders can currently benefit indirectly under the schemes as both SMEs and large companies can receive the tax credit where they sub-contract R&D to partnerships and sole traders. Furthermore, it is understood that the very significant majority of R&D work of over £10,000 per annum is undertaken by companies. Where this is not the case special purpose companies can be set up with individuals or partnerships as sole shareholders, which may also have other business benefits. It is not therefore proposed at this time to set up new schemes aimed at non-corporate entities.

Changes proposed not raised in the consultation document

3.4 The SME definition used for the SME scheme is contained in a European Commission Recommendation of 1996. The Commission has stated this Recommendation will be replaced with effect from 1 January 2005 and the new Recommendation has been published. This new Recommendation increases the financial limits for what qualifies as a SME. This means more companies will benefit from the higher rate and payable credit of the SME scheme. It also introduces new rules relating to the control tests governing whether or not ownership of a company by other entities

results in it not being a SME, despite meeting the financial criteria. Some aspects of the current control test were queried by respondents. Some of these concerns will be addressed by the new Recommendation, for example the position of some university spin out companies may be improved. **A new SME definition will enhance the R&D schemes and it is proposed to give statutory effect to the new Recommendation in due course**.

3.5 When the R&D schemes were introduced, staff costs were defined as specifically excluding benefits in kind. This is to ensure staff costs can be quickly and easily ascertained without the complication of calculating the cost to the company of benefits provided to individual R&D staff. However staff costs were amended by the second tax law rewrite Act, Income Tax Earnings and Pensions Act 2003, to include benefits in kind. This change was inadvertent and results in tax credits being available for the value of the benefit to the employee, not the cost to the company of providing it. **It is intended to correct this and return to the generally understood position that benefits in kind do not qualify for the tax credit**.

3.6 From 2005 the consolidated accounts of listed groups will be required by a Regulation of the European Commission to be in accordance with International Accounting Standards ('IAS'). It will be optional whether to use IAS. Adoption of IAS 38 may lead companies to charge R&D expenditure to their profit & loss account more slowly than at present. This could affect the timing of the R&D tax credit, which is based on the charge to the P&L account. **It is proposed that the legislation be modified to prevent any change in the timing of the relief from the adoption of IAS.**

Vaccines research relief

3.7 In order to simplify claims for companies who benefit from both the R&D tax credit and the vaccines research relief, it is proposed that any **changes to the R&D tax credit scheme should also take effect, modified as appropriate, for vaccines research relief**. These improvements will be a further boost to the support for companies undertaking research into vaccines for the killer diseases of the developing world.

State aid rules

3.8 The SME R&D tax credit scheme and vaccines research relief are both notified State Aids. This means any modifications to them must be cleared with the European Commission before they can take effect. The improvements proposed in this document are contingent upon the European Commission's acceptance.

Appendix A1: Guidelines on the Meaning of Research and Development for Tax Purposes

Important notice:
The following text does not have any legal force, and is intended only to indicate a possible form of words for a revised definition of R&D for tax purposes.

1 Research and development ('R&D') is defined for tax purposes in Section 837A Income and Corporation Taxes Act 1988[1]. This says the definition of R&D for tax purposes follows generally accepted accounting practice. SSAP 13 *Accounting for research and development* is the Statement of Standard Accounting Practice which defines R&D. The accountancy definition is then modified for tax purposes by these Guidelines, which are given legal force by Parliamentary Regulations. These Guidelines explain what is meant by R&D for a variety of tax purposes, but the rules of particular tax schemes may restrict the qualifying expenditure.

2 In these Guidelines a number of terms are used which are intended to have a special meaning for the purpose of the Guidelines. Such terms are **highlighted** on first appearance and defined later.

THE DEFINITION OF RESEARCH & DEVELOPMENT

3 R&D for tax purposes takes place when an **overall project** seeks to achieve **an advance in science or technology**.

4 All of the **individual activities** which **directly contribute** to achieving this advance in science or technology through the resolution of **scientific or technological uncertainty** are R&D.

5 Certain **qualifying indirect activities** related to an overall project are also R&D. Activities other than qualifying indirect activities which do not directly contribute to the resolution of scientific or technological uncertainty in an overall project are not R&D.

ADVANCE IN SCIENCE OR TECHNOLOGY

6 An advance in science or technology means an advance in overall knowledge or capability in a field of **science** or **technology** (not a company's own state of knowledge alone). This includes the adaptation of knowledge or capability from another field of science or technology in order to make such an advance.

[1] For the purposes of research and development allowances (Part VII Capital Allowances Act 1990) this definition is extended to include oil and gas exploration and appraisal as defined in Section 837B Income and Corporation Taxes Act 1988. These Guidelines apply to this extended definition as well.

7 An advance in science or technology may have tangible consequences (such as a new or more efficient cleaning product, or a process which generates less waste) or more intangible outcomes (new knowledge or cost improvements, for example).

8 A process, material, device, product, service or source of knowledge does not become an advance in science or technology simply because science or technology is used in its creation. Work which uses science or technology but which does not advance scientific or technological capability as a whole is not an advance in science or technology.

9 Work carried out in a field of science or technology which, for example,

(a) generates scientific or technological knowledge which is **new to the field**;

(b) creates a process, material, device, product or service which is new to the field;

(c) **appreciably improves** something which already exists through scientific or technological changes; or

(d) uses science or technology to duplicate the effect of an existing process, material, device, product or service in a new or appreciably improved way (e.g. to design a product which has exactly the same performance characteristics as existing models, but is built in a fundamentally different manner)

will be an advance in science or technology.

10 Even if the advance in science or technology sought by an overall project is not achieved or not fully realised, R&D still takes place.

11 If a particular advance in science or technology has already been made or attempted but details are not readily available (for example, if it is a trade secret), work to achieve such an advance can still be an advance in science or technology.

12 However, the routine analysis, copying or adaptation of an existing product, process, service or material, will not be an advance in science or technology.

SCIENTIFIC OR TECHNOLOGICAL UNCERTAINTY

13 Scientific or technological uncertainty exists when knowledge of whether something is scientifically possible or technologically feasible is not readily available or deducible by a competent professional working in the field. This includes **system uncertainty**. Scientific or technological uncertainty will often arise from turning something that has already been established as scientifically feasible into a cost-effective, reliable and reproducible process, material, device, product or service.

14 Uncertainties that can readily be resolved by a competent professional working in the field are not scientific or technological uncertainties. Similarly, improvements, optimisations and fine-tuning which do not materially affect the underlying science or technology do not constitute work to resolve scientific or technological uncertainty.

OTHER DEFINITIONS

Science

15 Science is the systematic study of the nature and behaviour of the physical and material universe. Work in the arts, humanities and social sciences, including economics, is not science for the purpose of these Guidelines. Mathematical techniques are frequently used in science, but mathematical advances in and of themselves are not science unless they are advances in representing the nature and behaviour of the physical and material universe.

16 These Guidelines apply equally to work in any branch or field of science.

Technology

17 Technology is the practical application of scientific principles and knowledge, where 'scientific' is based on the definition of science above.

18 These Guidelines apply equally to work in any branch or field of technology.

Overall project

19 The overall project consists of one or more **individual activities** conducted to a method or plan in order to achieve an advance in science or technology. It is important to get the boundaries of the overall project correct. It should encompass all the individual activities which collectively serve to resolve the scientific or technological uncertainty associated with achieving the advance, so it could include a number of different sub-projects. An overall project may itself be part of a larger commercial project, but that does not make the parts of the commercial project that do not address the scientific or technological uncertainty of the overall project into R&D.

New to the field

20 Knowledge will be new to a field of science or technology if it was not publicly available, or readily deducible from established knowledge or practice in the field. This includes knowledge adapted from another field of science or technology where this adaptation was not readily deducible.

21 A process, material, device, product or service will be new to the field if it incorporates or represents new scientific or technological knowledge or capability. This includes scientific or technological knowledge or capability adapted from another field of science or technology where this adaptation was not readily deducible.

22 A process, material, device, product or service will not be new to the field if it simply brings a company into line with existing practice or standards in the field, even though it may be completely new to the company or the company's trade.

Appreciable improvement

23 Appreciable improvement means to change or adapt the scientific or technological characteristics of something to the point where it is 'better' than the original. The improvement should be more than a minor or routine upgrading, and should represent something that would generally be acknowledged by a competent professional working in the field as a genuine and non-trivial improvement. Improvements arising from the adaptation of knowledge or capability from another field of science or technology are appreciable improvements if they would generally be acknowledged by a competent professional working in the field as a genuine and non-trivial improvement.

24 Improvements which arise from taking existing science or technology and deploying it in a new context (e.g. a different trade) with only minor or routine changes are not appreciable improvements. A process, material, device, product or service will

not be appreciably improved if it simply brings a company into line with existing science or technology, even though it may be completely new to the company or the company's trade.

25 The question of what scale of advance would constitute an appreciable improvement will differ between fields of science and technology and will depend on what a competent professional working in the field would regard as a genuine and non-trivial improvement.

Individual activity

26 An individual activity is an identifiable element of an overall project with a specific aim or outcome. The individual activity may itself comprise a number of constituent parts or sub-activities.

Directly contribute

27 To directly contribute to achieving an advance in science or technology, an individual activity must attempt to resolve an element of the scientific or technological uncertainty associated with achieving the advance. This includes activities to adapt software or equipment needed to help resolve the scientific or technological uncertainty, scientific or technological testing and analysis, work to create new tools, materials or computer programs needed to carry out the R&D, and other activities which are essential elements of the scientific or technological work being undertaken, provided that equipment or software is adapted or created solely for use in R&D.

28 Activities which do not directly contribute to the resolution of scientific or technological uncertainty include:

(a) the range of commercial and financial steps necessary for innovation and for the successful development and marketing of a new or appreciably improved process, material, device, product or service;

(b) work to develop non-scientific or non-technological aspects of a new or appreciably improved process, material, device, product or service;

(c) the production and distribution of goods and services;

(d) administration and other supporting services; and

(e) general support services (such as transportation, storage, cleaning, repair, maintenance and security).

System uncertainty

29 System uncertainty is scientific or technological uncertainty that results from the complexity of a system rather than uncertainty about how its individual components behave. For example, in electronic devices, the characteristics of individual components or chips are fixed, but there can still be uncertainty about the best way to combine those components to achieve an overall effect. However, assembling a number of components (or software sub-programs) to an established pattern, or following routine methods for doing so, involves little or no scientific or technological uncertainty.

30 Similarly, work on combining standard technologies, devices, and/or processes can involve scientific or technological uncertainty even if the principles for their integration are well known. There will be scientific or technological uncertainty if a competent professional working in the field cannot readily deduce how the separate components or sub-systems should be combined to have the intended function.

Qualifying indirect activity

31 These are activities which form part of the overall project but do not directly contribute to the resolution of the scientific or technological uncertainty. They are:

- scientific and technical information services, insofar as they are conducted for the purpose of R&D support (such as the preparation of the original report of R&D findings);
- indirect supporting activities such as maintenance, security, administration and clerical activities, and finance and personnel activities, insofar as undertaken for R&D;
- certain ancillary activities essential to the undertaking of qualifying R&D (e.g. taking on and paying staff, leasing laboratories and maintaining research and development equipment including computers used for R&D purposes);
- training required to directly support an R&D project;
- research by students and researchers carried out at universities;
- research (including related data collection) to devise new scientific or technological testing, survey, or sampling methodsfeasibility studies to inform the strategic direction of a specific R&D activity.

32 Activities not described in paragraph 31 are not qualifying indirect activities.

COMMENTARY ON PARTICULAR QUESTIONS WHICH ARISE

Start and end of R&D

33 R&D begins when work to resolve the scientific and technological uncertainty starts, and ends when that uncertainty is substantially resolved. This means that work to identify the requirements for the process, material, device, product or service, where no scientific or technological questions are at issue, is not R&D.

34 R&D ends when knowledge is codified in a form usable by a competent professional working in the field, or when a prototype or pilot plant with all the functional characteristics of the final process, material, device, product or service is produced.

35 Although the R&D for a process, material, device, product or service may have ended, new problems which involve scientific or technological uncertainty may emerge after it has been turned over to production or put into use. The resolution of these problems may require new R&D to be carried out. But there is a distinction to be drawn between such problems and routine fault fixing.

Planning as part of R&D

36 Scientific or technological planning activities associated with an overall project directly contribute to resolving the scientific or technological uncertainty associated with the project, and are therefore R&D. These include defining scientific or technological objectives, assessing scientific or technological feasibility, identifying particular scientific or technological uncertainties, estimating development time, schedule, and resources of the R&D, and high-level outlining of the scientific or technical work, as well as the detailed planning and management of the work.

37 Elements of a company's planning activity relating to an overall project but not directly contributing to the resolution of scientific or technological uncertainty, such as identifying or researching market niches in which R&D might benefit a company, or examination of a project's financial, marketing, and legal aspects, fall outside the category of scientific or technological planning, and are therefore not R&D.

Abortive projects

38 Not all overall projects succeed in their aims. What counts is whether there is an intention to achieve an advance in science or technology, not whether ultimately the associated scientific or technological uncertainty is completely resolved, or resolved to the degree intended. Scientific or technological planning activities associated with R&D projects which are not taken forward (e.g. because of insurmountable technical or commercial challenges) are still R&D.

Prototypes, pilot plants

39 A prototype is an original model on which something new or appreciably improved is patterned, and of which all things of the same type are representations or copies. It is a basic experimental model possessing the essential characteristics of the intended process, material, device, product or service. The design, construction, and testing of prototypes generally fall within the scope of R&D for tax purposes. But once any modifications necessary to reflect the test findings have been made to the prototypes, and further testing has been satisfactorily completed, the scientific or technological uncertainty has been resolved and further work will not be R&D.

40 Similarly the construction and operation of pilot plants while assessing their operations is R&D until the scientific or technological uncertainty associated with the intended advance in science or technology has been resolved.

Design

41 When achieving design objectives requires the resolution of scientific or technological uncertainty within an overall project, work to do this will be R&D. Design activities which do not directly contribute to the resolution of scientific or technological uncertainty within an overall project are not R&D.

Cosmetic and aesthetic effects

42 Cosmetic and aesthetic qualities are not of themselves science or technology, and so work to improve the cosmetic or aesthetic appeal of a process, material, device, product or service would not in itself be R&D. However, work to create a desired cosmetic or aesthetic effect through the application of science or technology can require a scientific or technological advance, and resolving the scientific or technological uncertainty associated with such a project would therefore be R&D.

Content delivered through science or technology

43 Information or other content which is delivered through a scientific or technological medium is not of itself science or technology. However, improvements in scientific or technological means to create, manipulate and transfer information or other content can be scientific or technological advances, and resolving the scientific or technological uncertainty associated with such projects would therefore be R&D.

EXAMPLES/ILLUSTRATIONS

Examples in these Guidelines are illustrative, designed to cast light on the principles explained in the Guidelines, and should be read in that context.

A. The R&D process

A1. A company conducts extensive market research to learn what technical and design characteristics a new DVD player should have in order to be an appealing product. This work is not R&D (paragraph 37). However, it does identify a potential overall project to create a DVD player incorporating a number of technological improvements which the company's R&D staff (who are competent professionals) regard as genuine and non-trivial. This overall project would therefore be seeking to develop an appreciably improved DVD player (paragraphs 23-25) and would therefore be seeking to achieve an advance in science or technology (paragraph 9(c)).

A2. The company then decides on a detailed specification for the desired new product, and devises a plan for developing it. Some elements of this plan involve planning of activities which directly contribute to resolving the project's scientific or technological uncertainties (such as the system uncertainty associated with an improved control mechanism for the laser that 'reads' the DVD). This element of planning is R&D (paragraph 36), as are the activities themselves (paragraph 4). Other elements of the plan focus on obtaining intellectual property protection or cosmetic design decisions, for example, which do not directly contribute to resolving the project's scientific or technological uncertainties and are not qualifying indirect activities (paragraph 31) and are therefore not R&D. Neither this planning (paragraph 37) nor these activities (paragraph 28) are R&D.

A3. The scientific or technological work culminates in the creation of a series of prototype DVD players, and ultimately a 'final' prototype is produced and tested which possesses the essential characteristics of the intended product (circuit board design, performance characteristics, etc.). All the activities which directly contributed to resolving the scientific or technological uncertainty of creating the DVD player up to this point (such as the testing of successive prototypes) are R&D.

A4. Several copies of this prototype are made (not R&D) and distributed to a group of consumers to test their reactions (not R&D). Some of these consumers report concerns about the noise level of the DVD player in operation. Additional work is done to resolve this problem. If this involves a routine adjustment of the existing prototype (i.e. no scientific or technological uncertainty) then it will not be R&D; if it involves more substantial changes (i.e. there is scientific or technological uncertainty to resolve) then it will be R&D.

B. Equal applicability in any branch or field of science or technology

B1. The Guidelines apply equally to work in any branch or field of science or technology. This means that work in software engineering, for example, is subject to the same fundamental criteria for being R&D as work in textile science, or nanotechnology, or anything else.

B2. This equality also applies to the methods used to resolve scientific or technological uncertainty. For example, it is sometimes possible to implement functionality in a product or process by means of software or of hardware. As long as the scientific or technological uncertainty cannot readily be resolved by a competent professional working in the field, hardware and software methods are both equally R&D in these circumstances.

C. Abortive projects

C1. Not all overall projects achieve the advance in science or technology they are seeking. For example, work to insert a particular gene into a gene sequence may simply fail, while an attempt to appreciably increase the life of a battery may only yield a marginal improvement. In both cases, the overall project seeks to achieve an advance in science or technology and would be R&D.

D. Advance in science or technology

D1. Searching for the molecular structures of possible new drugs would be an advance in science or technology, because it applies existing knowledge of science (which compounds are known to cause particular physiological effects) in search of new or improved active compounds (paragraph 9(b)). This is true even if the method used to search for those molecular structures (e.g. running a computer programme on a particular set of data) is itself entirely routine. Work to identify new uses of existing compounds would also be creative work in science or technology, because it seeks new scientific knowledge about those molecules (paragraph 9 (a)).

D2. However, the development of software intended for the analysis of market research data (which is not scientific or technological knowledge) which was not expected to result in the development of a scientific or technological advance in the field of software as a whole (such as an algorithm which is new to the field of software) would not be R&D (paragraph 8). Work to adapt such software to analyse, say, customer spending patterns would also not be R&D.

D3. An advance in science or technology need not imply an absolute improvement in the performance of a process, material, device, product or service. For example, the existence of high-fidelity audio equipment does not prevent a project to create lower-performance equipment from being an advance in science or technology (for instance, if it incorporated technological improvements leading to lower cost through more efficient circuit design or speaker construction).

D4. In general, an advance in science or technology is still possible (paragraph 11) even if:

Several companies are working at the cutting edge in the same field, and are doing similar work independently;

Work has already been done but this is not known in general because it is a trade secret, and another company repeats the work; or

it is known that something has been achieved, but the details of how are not readily available.

E. Scientific or technological uncertainty

E1. A firm's overall project involves finding a new active ingredient for weed-killer (new knowledge of science or technology, and a new substance), and developing a formula incorporating the new active ingredient for use as a commercial product (which – depending on how different the operation of the new ingredient is from current weed-killers – could be argued to be either new or appreciably improved). Both of these would constitute an advance in science or technology.

E2. In order to achieve this advance, a programme of investigation by computer to pick likely ingredients and the systematic testing of possible ingredients and products based on those 'trial' ingredients is undertaken. The work involves the adaptation of existing software to tackle the specific problem, and product formulation and testing using established methods. This investigation and testing evaluates the weed-killing performance and other relevant characteristics of the formulations (for example, toxicity to humans and wildlife, water solubility, adhesion to weeds, damage done to other

plants). All of these activities would therefore be R&D (paragraph 4).

E3. The company also does work to assess what characteristics a new weed-killing product should have in order to appeal to consumers. This activity does not directly contribute to the resolution of scientific or technological uncertainty, and is therefore not R&D.

F. Direct contribution to the resolution of scientific or technological uncertainty

F1. Work to compare the effectiveness of two possible designs for controlling part of a new manufacturing process would directly contribute to resolving the scientific or technological uncertainty inherent in the new process, and hence the activity would be R&D (paragraphs 4, 27). But work to raise finance for the project, while *indirectly* contributing to the resolution of scientific or technological uncertainty (e.g. by paying for work) does not of itself help resolve the uncertainty, and hence is not R&D.

G. Testing as part of R&D

G1. Scientific or technological testing and analysis which directly contributes to the resolution of scientific or technological uncertainty is R&D (paragraph 27). So for example if testing work is carried out as part of the development of a pilot plant, this would be R&D, but once the design of the 'final' pilot plant had been finalised and tested, any further testing would not be R&D (paragraph 39). However, if flaws in the design became apparent later on, then work to remedy them would be R&D if they could not readily be resolved by a competent professional working in the field (in other words, if there was scientific or technological uncertainty around how to fix the problem).

H. Cosmetic and aesthetic effects

H1. A company is seeking to make a water-breathable fabric for use in hiking gear. A test fabric with the required physical characteristics is produced through R&D. This new fabric is then produced in small quantities (not R&D) and market tested with a number of trial users. The user tests are not R&D, because they are concerned with testing the commercial potential of the new material and assessing its appeal to users (paragraph 42).

H2. One of the results of these tests is that users do not like the feel of the new fabric against their skin, and dislike its shiny appearance. The company decides to investigate variants of its new fabric, which require significant changes to the material's weave and physical structure, to overcome these problems. Because there is scientific and technological uncertainty around whether a material with the desired physical characteristics can be made, the R&D continues.

J. Overall project, prototype and end of R&D

J1. A company develops new spark plugs for use in an existing petrol engine. The scientific or technological uncertainty associated with this work is resolved once prototype plugs have been fully tested in the engine. The activities directly contributing to this work, including the construction of prototypes and their testing in the engine, would be R&D.

J2. The same company decides to design a new engine to incorporate the new spark plugs, involving a new combustion chamber design, lighter materials and other improvements such that the overall engine is appreciably improved (it uses less petrol to achieve slightly greater power output performance, and generates less pollution than current models). The activities directly contributing to this work, including the design of the separate components (not all of which need be different from those used in previous models) and their integration into a new engine, are R&D. The uncertainty associated with this work is resolved, and R&D is complete. once a functionally final prototype has been tested.