



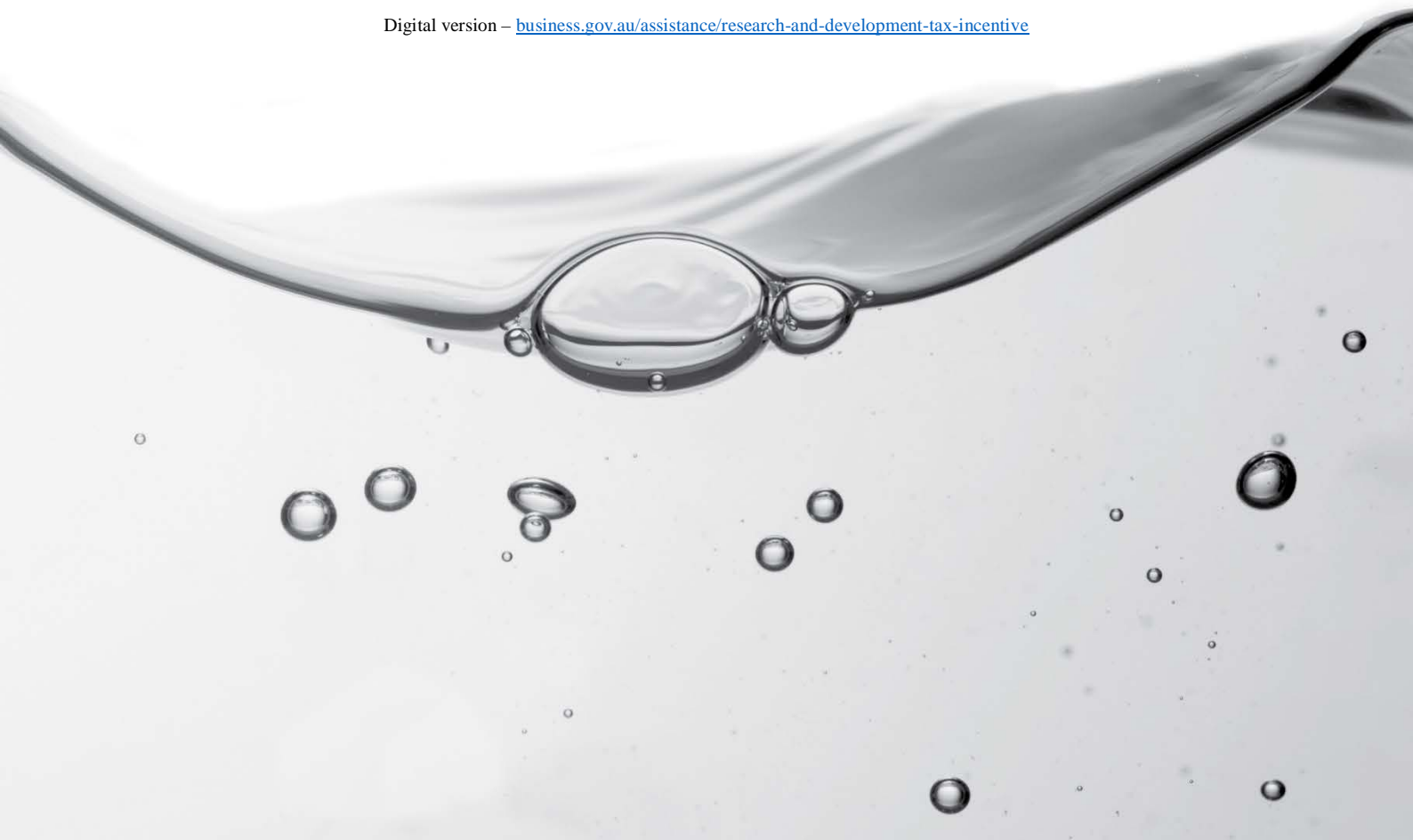
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Business
R&D Tax Incentive

ICT and the R&D Tax Incentive

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How to use this Guide

The R&D Tax Incentive programme provides an incentive for companies performing eligible research and development (R&D). The programme is legislated and the rules appear in the legislation¹.

What does this guide do?

As a key enabler of business and innovation, ICT is central to services, processes and products across virtually all sectors of the economy.

This guide helps clarify how to self-assess the eligibility of ICT related R&D activities.

A series of examples show how to identify what eligible R&D might be and how to register eligible R&D activities.

No single example (or set examples) can represent the multiple combinations of company structures, operations, management, record keeping systems and expenditure. However, the business scenarios chosen attempt to broadly examine some highlighted issues identified as facing the ICT industry and at various points in a business R&D cycle. These issues were identified during consultation with business, industry representatives and tax agents.

While they follow the same format, the focus of each example is different. Through this mix, the Department of Industry, Innovation and Science (the department) has aimed to illuminate the range of issues that arose during close consultation with the ICT sector.

In addition, the department provides information on the R&D Tax Incentive that highlights issues relevant to the ICT sector through business.gov.au and the *R&D Tax Incentive Information eBulletin*. This edition of the guide replaces the [2012] edition.

If your company is spending money to experimentally solve technical problems or experimentally develop new products or services, you may be undertaking some activities that qualify as R&D under the Incentive. The examples in the Guide² address key eligibility requirements such as:

- new knowledge,
- experimental process,
- core and supporting R&D activities,
- records management and compliance assurance,
- excluded activities, and

¹ See, division 355 of the *Income Tax Assessment Act 1997*. The definitions of eligible R&D activities are contained in sections 355-20, 25 and 30 of that Act.

² The examples used in this guidance are fictional examples created to illustrate application of the R&D Tax Incentive to hypothetical commercial enterprises. The examples reflect the department's experience with jointly administering the programme with the Australian Taxation Office. No similarity of the examples to existing enterprises or projects is intended.

- activities likely to be ineligible.³

These concepts are incorporated throughout the guide with clear examples to highlight the issues. Commentary is also provided at the end of each example to direct companies to the important linkages to other guidance that has already been published to assist companies to de-risk their participation in the programme and evaluate their own 'compliance readiness'.

This guidance should be used in conjunction with the *R&D Tax Incentive: A Guide to Interpretation* which is available on the business.gov.au website.

Why is it important to use this guide?

This guide will assist companies and tax advisors to understand the eligibility requirements that apply to activities that are supported under the R&D Tax Incentive. Following this guide will:

- enable companies to self-assess and register eligible R&D, and
- help companies avoid:
 - compliance reviews, which may involve additional legal fees and tax agent fees, and
 - potential repayment of the tax benefit.

What is eligible R&D?

Eligible R&D is defined in the legislation. Companies self-assess whether their activities are eligible R&D activities before registering under the programme.

R&D Activities

Under the R&D Tax Incentive, R&D activities must either be:

- **Core R&D activities.** These are systematic, hypothesis-driven experimental activities with an unknown outcome and based on the principles of established science, undertaken to generate new knowledge (including new knowledge in the form of new or improved materials, products, devices, processes or services), or
- **Supporting R&D activities.** These are activities that are not part of the experimental activities, but directly support them.

Registration

The programme is accessed by registering self-assessed R&D activities with the department (this must be done within 10 months of the end of the company's income year) and claiming for eligible expenses relating to the registered activities in the company's tax return.⁴

³ See page 8 for summaries of the examples that show these concepts.

⁴ Information on the benefits available through the programme and the registration application form are available on business.gov.au.

Companies applying to register for the R&D Tax Incentive must self-assess their activities against the legislated eligibility criteria. When a registration is accepted this does not mean that the registered activities have been determined to be eligible. The department routinely examines registrations in detail for compliance and may contact companies for further information.

The department applies the programme's legislative requirements during its registration and compliance processes and will do so as set out in its guidance. Registering companies must maintain adequate records that can allow self-assessment by substantiating the eligibility of R&D activities. Companies must ensure expenditure claimed for R&D activities is based on genuine financial records, as is the case for any element of their tax return.

Companies may choose to use an R&D tax advisor to help prepare applications and registrations. However, the use of an R&D tax advisor is not a requirement of entry into any departmental programme and using the services of an R&D tax advisor to assist with the preparation of a registration application and offset claim does not guarantee eligibility. Companies wishing to get an assurance whether particular activities they are currently conducting, or are intending to conduct, are eligible R&D activities may apply to the department for an Advance Finding.

Eligibility must be self-assessed for activities, not for whole projects.

Companies and advisors also need to be aware of expenditure that is ineligible under the R&D Tax Incentive. This includes:

- interest expenditure (within the meaning of interest in the withholding tax rules),
- expenditure that is not at risk,
- core technology expenditure, and
- expenditure included in the cost of a depreciating asset (decline in value notional deductions may apply however).

Note: Readers with questions about the eligibility of expenditure items on R&D activities registered under the R&D Tax Incentive should consult the ATO through its website at ato.gov.au/business/research-and-development-tax-incentive/, by phone on 13 28 66 (for businesses) or 13 72 86 (for tax agents).

Other relevant publications

[R&D Tax Incentive: A Guide to Interpretation](#) – this document provides companies with the government's interpretation of the legislative requirements of the programme, including a detailed overview of core and supporting R&D activities. In addition, there are checklists and examples of activities unlikely to meet the programme requirements.

[Getting software development R&D Tax Incentive claims right](#) – this document provides companies and tax advisors with guidance on areas they need to consider when self-assessing activities for eligibility under the R&D Tax Incentive. This document also discusses activities that do not meet the eligibility rules and highlights specific problem areas the department sees in incorrect claims.

Compliance Readiness

The department has released guidance to help companies that intend to register for the R&D Tax Incentive to ensure that they are ‘compliance ready’⁵. Compliance readiness means having in place the systems and processes to identify, evaluate and record eligible R&D activities and expenditure on those activities. First-time participants in the programme should seek assistance from the department to make sure they understand the programme’s requirements.

The following set of principles is suggested to assist companies in developing appropriate systems and processes to document their R&D activities and associated expenditure. It is important to note that the first step to ensuring compliance is reviewing and understanding the R&D Tax Incentive guidelines and requirements.

These principles have been informed by the department’s experience in conducting compliance assurance activities. The principles also take into account key Administrative Appeals Tribunal decisions, where failures in a company’s or tax agent’s assessment of eligible R&D activities resulted in tax claims for R&D being overturned.

Maintaining contemporaneous documentation that demonstrates eligibility under the programme is essential. Companies cannot establish eligibility without maintaining detailed documentation that records the process of each activity as it develops.

Principle 1

Ensure that internal processes and systems allow for documentation of how activities meet eligibility requirements as part of the overall project planning and management process.

Principle 2

Identify and document eligible R&D activities at the time they are conducted – this improves the potential to capture associated costs in real time.

Principle 3

Document methods for identifying eligible R&D activities and recording expenditure associated with eligible activities. This ensures that there is a clear understanding of how information has been derived and enables the process to be repeated in future years.

Principle 4

Forge strong connections between those responsible for preparing and maintaining R&D Tax Incentive records and staff who understand the technical aspects of activities to enable a shared understanding of programme requirements.

Principle 5

Ensure that strong links have been established between activity and expenditure records

⁵ *Compliance Readiness – Importance of Record Keeping and Compliance Readiness – Risk Review and Findings* are available on business.gov.au.

The Examples

Projects to develop new products or services undertaken by companies are generally comprised of activities. Eligibility under the R&D Tax Incentive cannot be self-assessed at the project level. The legislation governing the programme requires eligibility to be assessed at the level of the activities within the project.

The examples in this document illustrate the eligibility requirements of the programme in the context of activities being conducted in hypothetical business scenarios.

Table 1 provides the reader with an idea of the level of detail contained in the examples on particular concepts.

Example 1 - DataCoAnalytics (Page 10)

Scenario

New algorithm for interrogating and displaying big data sets – this example has a detailed explanation of applying the R&D definition in a practical business situation.

R&D Tax Incentive Principles

This example shows the definition of eligible **core** and **supporting R&D activities** in a practical business situation. It provides an example of distinguishing between core and supporting R&D activities. It also provides information on software development activities that are **likely to be ineligible**, **record keeping** and the **internal administration exclusion**.

Example 2 - ColdTec (Page 18)

Scenario

Cloud computing in a manufacturing environment – this study shows how a company identifies eligible activities in using knowledge in a new field.

R&D Tax Incentive Principles

This example further explores the definitions of eligible **core** and **supporting R&D activities** in the context of a company that is developing a new cloud-based product. The example also provides information on supporting **documentation**.

Example 3 - eWatchMakers (Page 24)

Scenario

Software modules for electronic watches – this example attempts to link R&D activities management with events in a 2–3 year business cycle.

R&D Tax Incentive Principles

This example highlights **core** and **supporting R&D activities** as it follows a company through a series of years to develop a new smart watch product and then develop that concept further. The example shows how the company was able to offset some of the cost of its technical failures through the programme.

Example 4 - Push Through Technologies (Page 30)

Scenario

New algorithms for mobile communications system — this example shows how a company registers activities in an R&D project that include activities that need to be conducted overseas.

R&D Tax Incentive Principles

This example shows a company applying for an **Advance/Overseas Finding** to allow it to register overseas activities. It also provides examples of **core** and **supporting R&D activities**.

TABLE 1 · This table identifies which issues are discussed in which examples

KEY CONCEPT	EXAMPLE 1 DataCoAnalytics	EXAMPLE 2 ColdTec	EXAMPLE 3 eWatchMakers	EXAMPLE 4 Push Through Technologies
Core R&D activities	■	■	◆	◆
Core R&D activities – scope		●	■	
Core R&D activities – early termination of a business project			■	
Examples of activities that are not or not likely to be core R&D activities	◆			
Supporting R&D activities	■	◆	◆	◆
Supporting activities – dominant purpose	●			
‘Internal Administration’ exclusion from being a core R&D activity	●			
Record keeping	■	◆	◆	◆
Advanced/Overseas Findings				■
Collaboration				◆

- Concept explored in the example and an expanded explanation given in the commentary
- ◆ Concept explored in the example
- Concept explored in the commentary section

Note that the following issues are administered by the ATO:

- Feedstock adjustment
- Clawback adjustment

Example 1: DataCoAnalytics

This example illustrates the application of two key legislative requirements in the definition of core R&D activities:

- ‘whose outcome cannot be known or determined in advance on the basis of current knowledge, information or experience, and’
- ‘experimental activities that are conducted for the purpose of generating new knowledge’.

The example presents a business scenario and commentary illustrating these concepts. The example also explores the identification of core R&D activities, supporting R&D activities, the listed exclusions and records management.

This example highlights that by keeping good documentation right throughout the project, DataCoAnalytics:

- can carry out a self-assessment of the eligibility of activities,
- is better placed to provide clear and accurate descriptions of its activities in its registration application,
- reduces its compliance costs and risks in preparation for a possible review in the future, and
- helps to ensure that its project is well managed, efficiently carried out and knowledge is captured.

Business Scenario

DataCoAnalytics has received an extremely large data set courtesy of the Square Kilometre Array (SKA), and is contemplating using it to produce a primary school teaching package (“SkyWonder”) which will use the data to create 3D visual depictions of areas of outer space.

The company conducted a range of activities in order to research, develop, test and finalise its product. After searching the market place and open source repositories, DataCoAnalytics could not find an existing tool or solution that it could apply to query the SKA data set, and to do so in the speed needed for SkyWonder. Additionally, the company’s software developers did not know how to design suitable algorithms even after consulting their professional networks. This meant that the company needed to experimentally develop and then implement a new approach to solving its problem.

DataCoAnalytics embarked on a project to create new algorithms that could rapidly search the SKA data set to locate elements necessary to display 3D images based on parameters a user has selected. DataCoAnalytics also proceeded to develop the graphical user interface (GUI) for SkyWonder using the Java and OpenGL programming languages.

In order to access the R&D Tax Incentive DataCoAnalytics needed to self-assess which of its activities were eligible as core R&D activities or supporting R&D activities, in addition to identifying the activities that were not eligible and would not be registered. In the course of its self-assessment the company decided it could register one core R&D activity and one supporting R&D activity.

SkyWonder Project Core R&D Activity 1: *Development of the new algorithms to the new “SkyWonder” product suite*

DataCoAnalytics considered the department’s guidance material on eligible R&D activities, including the [R&D Tax Incentive: A Guide to Interpretation](#)⁶, and self-assessed that developing the new algorithm could be registered as an eligible core R&D activity.

A core R&D activity is an activity that comprises an experiment, or set of related experiments, conducted in a systematic progression of work. A systematic progression of work proceeds from hypothesis to experiment and includes the observation of the experiment, its evaluation, and leads to logical conclusions about whether the hypothesis is correct or not.

A hypothesis is a statement that can be proven right or wrong by conducting an experiment. It reflects a particular technical or scientific idea and is commonly expressed as a relationship between variables or technical features.

The systematic progression of work must be undertaken for at least a significant purpose⁷ of generating new knowledge (whether the hypothesis is correct or not). The new knowledge must not have been able to be known or determined in advance of the experiment on the basis of current knowledge, information or experience available to a competent professional in the field.

To work out what it needed to do to develop its product, DataCoAnalytics had undertaken a literature and technology review to search for existing “data search and integration” algorithms. It evaluated each of these algorithms and documented their capabilities and limitations. After this evaluation DataCoAnalytics concluded that the existing algorithms could not provide the solution it required. The company was careful to document its reasons for this conclusion. The software developers then discussed how to design an algorithm to deliver the solution required. They consulted their networks and concluded that the task was not one that they could deliver confidently as there were significant specific technical unknowns that needed to be overcome. It was not just that it had not been done yet and so a new algorithm needed to be developed, but rather that all the available technical knowledge indicated that it could not be done using any known techniques. The documentation of the review and the emails between the software developers, where they discussed how to design the algorithm and the unknowns, provided good evidence that DataCoAnalytics had examined the existing knowledge, information and experience. It demonstrated that the company couldn’t produce the algorithm it needed without the new knowledge generated by conducting hypothesis-driven experimental

⁶ The department’s guidance on the R&D Tax Incentive is available on business.gov.au

⁷ The Administrative Appeals Tribunal found that:

... the purpose of generating new knowledge must be more than an insubstantial purpose; it must be substantial enough to enable the activity to be accurately characterised as conducted for that purpose [JLSP and Innovation Australia [2016] AATA 23 (22 January 2016) at 52].

activities. To be eligible for the R&D Tax Incentive, DataCoAnalytics knew that it needed to keep these documents.

DataCoAnalytics' chief systems architect coordinated ideas sessions among the programmers, which came up with the idea to enhance Big Data business interrogation tools with a bespoke algorithm. DataCoAnalytics planned a systematic approach for its work which included the development of hypotheses, experimental activities, hypotheses and described the unknown variables that were intrinsic to its testing activities. The hypotheses for this activity started with:

Test algorithm SRv0.1 will enhance the 'alpha' data extraction tool to interrogate a subset of the SKA dataset and accurately return relevant data

Each experiment informed a new hypothesis and a new experiment. Once a test algorithm was developed that successfully combined with a data extraction tool to search and return the relevant data from a subset, the company applied it to the full dataset and introduced a time component into the next new hypothesis and experiment. The company then progressively iterated the enhanced data extraction tool to deliver a faster interrogation and return until they reached the specific technical parameters they had set out to achieve. There were many times where the company needed to go back to the drawing board and revise its approach, using what it had learned from the experiments with previous versions of algorithms. However after many revisions, a workable algorithm was developed that proved that the new approach to data interrogation worked.

As part of the record keeping process, DataCoAnalytics recorded the nature and results of each hypothesis, each test using each hypothesis, and the evaluations of their performance.

SkyWonder Project Supporting R&D Activity 1: *Developing the graphical user interface (GUI)*

While this part of the business solution for “SkyWonder” was challenging for the business (particularly, those activities conducted to achieve consistent performance and presentation in the GUI) it was decided that the activity would not meet key legislative requirements in the definition of core R&D activities:

- requiring experimental activities whose outcome cannot be known or determined in advance on the basis of current knowledge, information or experience, and
- ‘experimental activities that are conducted for the purpose of generating new knowledge’.

While the company did not know the GUI's codebase before it was developed, and some of the user requirements were specified and changed along the way, all of the code of the GUI was based on existing knowledge about GUI development. The testing of code as it was developed was to debug and to verify it delivered the specified requirements, not to experimentally develop any new techniques or technology.

The key requirement for an activity to be assessed as a supporting R&D activity is that it must be directly related to a core R&D activity. This means that:

... the activity must have a direct, close and relatively immediate relationship with one or more components of the relevant systematic progression of work [in a core R&D activity] [R&D Tax Incentive: A Guide to Interpretation](#) (p 19)⁸.

After reading this, DataCoAnalytics self-assessed that ordinarily the development of a GUI would not be a supporting R&D activity as it would not meet the requirement to be directly related to a core R&D activity. However, DataCoAnalytics had a specific requirement that the speed of interrogation of the data algorithm would enable its GUI to allow the user to manipulate the visual display in real time with touch screen technology; including the ability to turn it around and look at it from different angles, to zoom in and out, and to display adjacent areas of space that were outside the original data that was returned from the coordinate search entered by the user. As a result, the search and display algorithms that were being developed needed to be able to respond appropriately to these inputs. This meant that the GUI was essential as part of the testing process for the new interrogation algorithms. Consequently, the special requirements for the SkyWonder GUI meant that it could establish a direct relationship to a core R&D activity. DataCoAnalytics identified the activity necessary to develop the GUI that was used for testing. It separated this from the further work required for the production GUI, as this was not directly related to the core activity.

DataCoAnalytics decided to register the activity as a supporting R&D activity directly related to the development of the new algorithms.

What documentation did DataCoAnalytics keep?

DataCoAnalytics kept appropriate business documentation to self-assess the eligibility of its activities and substantiate its claim for the R&D Tax Incentive. The company's effective management, good planning and robust business systems were fundamental ingredients to its successful innovation.

In relation to its R&D activities the company kept a register of all of the relevant technical scoping and project planning documents – these could be used to substantiate its claim should the company be subject to a compliance review by the department.

In relation to the R&D activities themselves, the company was careful to record how it planned and carried out its activities. It maintained records that demonstrated 'a systematic progression of work that is based on the principles of established science and proceeded from hypothesis, observation and evaluation and led to logical conclusions'. For example the company:

- retained the results of test runs of the algorithms, including 'failed' tests that produced incorrect results, and documented the results of running these prototypes on test data from the SKA.
- kept version repository logs with sufficiently detailed comments on the prototypes indicating the iterative development, testing and improvement of the algorithm including weaknesses that were identified and rectified in successive versions.

⁸ The department's guidance on the R&D Tax Incentive including the *Guide to Interpretation* is available on business.gov.au.

- managed its R&D using a project plan, including a risk management plan, that set out the business aims and technical hypotheses, explained the design of the experiments to test each of the hypotheses, described the observations and analysis that resulted from each of the experimental processes the company engaged in.

The company was also careful to keep a record of failed experiments. Failed experiments, while not conclusive, can support other evidence that the outcome of the experimental activities were not knowable or able to be determined in advance.

Commentary

Commentary on self-assessment and ICT eligibility considerations in general

The following commentary further explores the eligibility of various related ICT activities, concepts and challenges in terms of whether they reasonably comply with the programme's definition of core or supporting R&D activities. It is also intended to further guide and inform a company's self-assessment as it relates to listed ICT exclusions and common ICT-related activities.

Core R&D Activities – unknown outcome that cannot be known or determined in advance on the basis of current knowledge, information or experience

Core R&D activities are experimental activities that are conducted for at least a significant purpose of generating new knowledge. ICT participants must demonstrate that the activities being registered as core R&D activities are aimed at generating new knowledge that is outside current knowledge, information and experience. Participants will usually demonstrate this through undertaking and recording the results of a thorough analysis, including searches outside the company and its staff, regarding the current state of knowledge. For example, in the ICT sector this could include reports in reputable journals, blogs, wikis, etc.

A general principle when establishing the 'knowledge gap' is that programme participants must search beyond their direct competitors and own technical staff, and find out the current worldwide state of knowledge to demonstrate that a technical knowledge gap exists. Knowledge in other fields that an expert knows can be applied, should be considered. For example, if a company develops an industrial control system that uses visualisation algorithms that are not in competing industrial control systems, but similar ones may be found in other applications, it would be unlikely to be considered as new knowledge. In this situation the company could not claim that development as a core R&D activity unless it could demonstrate that new technical knowledge that could not be known or determined in advance was needed to complete the algorithms. Nor would these searches be considered a supporting R&D activity as they are not directly related to the systematic progression of work in the core R&D activity.

In relation to the DataCoAnalytics example, if there were algorithms in other areas of technology that could be adapted to provide the required functionality for SkyWonder without the need to conduct experiments to generate new knowledge, DataCoAnalytics's development activities would not meet this part of the definition, as the outcome was provided by using existing knowledge. This means that they would not be core R&D activities and could not be claimed.

To support a self-assessment that the outcome of experimental activities were not known or able to be determined from existing knowledge, information or experience available to a competent professional, companies should focus on explaining the process they used to arrive at the conclusion. This means how they determined that existing products, methodologies, technological information and expertise could not bridge the knowledge gap needed to complete the activities. In doing this, companies will be able to define what those knowledge gaps are (this must be included when the activities are registered for the programme).

Many software and technical development activities are not experimental activities. Examples of common ICT-related activities that are unlikely to be eligible core R&D activities include:

- Solving technical problems where similar problems have been overcome previously.
- Post-R&D activities such as preparation of user documentation and maintenance of existing systems.
- Minor adaptation of existing software, materials or products.
- Adding minor user functionality to existing application programmes or devices.
- De-bugging of production systems and products.
- Using the capabilities of existing software (such as application programming languages, graphical user interface builders, report generation tools or predictive models) as they are intended to be used and within their limitations.
- System integration where the technical components are known and uncertainty that it could be done is low.

Sometimes there is confusion about routine testing steps in software development projects. Many of these are tests for particular purposes that are not for the purpose of generating new knowledge, and are not hypothesis driven experiments. Examples of the types of testing activities that are not experiments include:

- Bug testing,
- Regression testing,
- Beta testing,
- User Acceptance Testing,
- System testing,
- Requirements testing,
- Data mapping and data migration testing,
- Testing the efficiency of different algorithms that are already known to work, and
- Testing websites in operation by measuring the number of hits.

Certain activities listed above may be eligible as supporting R&D activities if they are directly related to core R&D activities, and if necessary are being undertaken for the dominant purpose of supporting an eligible core R&D activity (see below for more information on the dominant purpose requirement).

Establishing the new knowledge threshold in systems integration

For activities involved in system integration, complexity (such as the complexity involved in combining multiple previously established systems, e.g. creating interfaces between a database and a user application) is not enough to support a self-assessment of eligibility.

System integration often uses known techniques and existing APIs. To identify eligible activities, companies need to identify the technical knowledge gaps that require experimental activities to overcome. It is particularly important to document why the technical knowledge gap could not be resolved with the current knowledge, information and experience available to a competent professional.

Some system integration activities could be supporting R&D activities if they are directly related to a core R&D activity.

The internal administration software development exclusion

It is important to establish whether development, modification or customisation of software was for the dominant purpose of internal administration by the company or a related or affiliated entity. If this was the case then such activities are specifically excluded from eligibility as a core R&D activity under the R&D Tax Incentive (in the DataCoAnalytics scenario this is not the case).

The core activity exclusion on 'internal administration' refers to the general internal business management functions of a company and can be taken to include, among others, the systems associated with the management of offices and staff, payroll and accounting, information management, and enterprise resource planning (ERP).

Software development activities that are focussed on the delivery or improvement of services offered to customers are by their nature unlikely to be used for internal administrative purposes because they are predominantly focussed on providing or improving a service to the customer.

In addition, the exclusion is not designed to capture software development activities where the dominant purpose is to sell the product on a commercial basis, even if it is business administration software.

It is important to note that this condition does not exclude applied software such as process control systems or firmware that forms an integral part of a home appliance or piece of industrial equipment, even if that software is not intended to be sold or distributed publicly.

Normally, activities that are excluded from being core R&D activities may still qualify as supporting R&D activities. However, software development activities that are captured by the 'internal administration' exclusion are also excluded from being a supporting R&D activity. This is because to be a supporting R&D activity, an excluded activity must be undertaken for the dominant purpose of supporting the core R&D activity. However, if the 'internal administration' exclusion has been triggered then the dominant purpose of that activity has already been established as being for its use in the internal administration of the business. There can only be one dominant purpose for undertaking an activity. As such, an activity undertaken for the dominant purpose of internal administration cannot also be for the dominant purpose of supporting a core R&D activity.

Supporting R&D Activities

Activities which do not form part of the experimental activities may be eligible as supporting R&D activities. This means that, as in the DataCoAnalytics example, companies may claim expenditure on activities that are directly related to the core R&D activity. 'Directly related' means an activity has to have a direct, close and relatively immediate relationship with the core R&D activities. DataCoAnalytics could demonstrate that direct link for the activity that developed the GUI used for experimenting with the new interrogation algorithm.

There is an additional consideration where the activities produce or are directly related to producing goods or services. In this situation, the activities must also be undertaken for the dominant purpose of supporting a core R&D activity. When companies are self-assessing for the dominant purpose they should weigh up the various purposes for conducting the activity and then determine which was the dominant (i.e. the ruling, prevailing or most influential purpose) of undertaking that particular activity⁹. As DataCoAnalytics had not reached a production stage, it did not need to apply this test.

⁹To assist companies determine whether their activity has the necessary relationship with the core R&D activity, they should weigh up the factors under 'What is the meaning of dominant purpose' in the *R&D Tax Incentive Customer Information Guide* available on business.gov.au. Additional information on dominant purpose is available on page 20 of the *R&D Tax Incentive: A Guide to Interpretation* which is available on business.gov.au.

Example 2: ColdTec

This example illustrates relevant considerations in the identification of core and supporting R&D activities including:

- the consideration of eligibility of activities which involve the application of existing technologies to new fields, and
- due diligence around the new knowledge threshold and establishing that core R&D activities are not determinable in advance by a competent professional in the field.

The example presents a business scenario and commentary on the relationship between core R&D activities, supporting R&D activities, the judgement required to group and categorise various R&D activities and the underpinning role of good records management,

Business Scenario

ColdTec is a small company that develops innovative ICT service products. Over the last 10 years, the company's business cycle has moved through successive phases of new product identification, R&D activity and subsequent commercialisation.

The company recently developed a new refrigerator logistics management technology application – Groceryvision. This product takes advantage of internet connectivity to automatically order replacement stock. It has potential commercial applications ranging from supermarket stock management and food service industries through to the domestic market.

The technology uses a series of small cameras inside the fridge to identify the number and status of products and then order replacements when needed. As Groceryvision relies on image recognition through its cameras rather than barcode scanning or manual operation, it needs to perform processor-intensive computer vision tasks several times a day. The company opted for a cloud computing solution because it would not be commercially viable to equip each fridge with the required processing power. This means that a fridge with Groceryvision simply uploads images to ColdTec's servers, where the image processing and ordering tasks are handled remotely.

After reviewing the department's guidance on business.gov.au, the company self-assessed that some of its work meets the eligibility requirements for registration under the R&D Tax Incentive. Consequently, the company registered three R&D activities with the department:

- two activities involved in developing and testing of specific technical elements of Groceryvision were self-assessed as core R&D activities, and
- a third activity, the development of software for image capture and upload was registered as a supporting R&D activity directly related to these core R&D activities.

Groceryvision Project Core R&D Activity 1: *Development of the specific image compression algorithm*

When ColdTec considered the department's guidance material on eligible R&D activities it self-assessed the development of the image compression algorithm to be a core R&D activity.

The company's self-assessment was based on the work it had already conducted to determine whether a solution was already available or able to be developed or adapted with professional expertise. Specifically, the company had conducted a literature and technology review to determine whether there were existing algorithms that could perform the necessary image compression within the memory constraints of the low-cost and low-power processors that would be used in Groceryvision fridges. The company had documented the functionality and limitations of existing image compression algorithms as it assessed them for suitability. As the company examined and ultimately rejected an existing algorithm it documented its reasons. Groceryvision also documented the advice of its software designers where it was advised why existing methods or technologies could not be adapted for this purpose. All existing algorithms had been developed to use much more powerful processors, and the known approaches simply could not work on the Groceryvision processor. The company would need to come up with a new approach.

The company maintained records of its searches and the analysis and reasons to support the conclusion that the generation of new knowledge was needed.

It then documented its hypothesised new approaches, and the systematic way it tried these by conducting targeted experiments to develop the algorithm for the fridge processors. By documenting the algorithm assessment the company undertook, these records also provided good evidence that the company had the significant purpose of generating new knowledge.

Groceryvision Project Core R&D Activity 2: *Cloud-based application of neural network computer vision techniques to grocery management*

ColdTec considered the department's guidance material and self-assessed the construction of the architecture for and training of the neural net algorithm to be a core R&D activity.

Computer vision is a well-established field. For this reason ColdTec needed to be diligent in documenting why the neural network training experimentation that it needed to conduct for the Groceryvision product could not be known or determined using existing knowledge, information and experience. To document this, ColdTec retained reports for management, records of literature searches, notes from questions posted on tech blogs, and a series of emails between an engineer and their head of product development that helped to summarise the reasons why risky experimentation needed approval. These emails made it clear that although neural networks have been used for computer vision in the past and might work in this setting, significant challenges were still present and the outcome of constructing the architecture and training of the neural network for this new application cannot be known or determined beforehand. For example, it was not known nor could it be determined without conducting an experiment whether the neural network could detect when a product needed re-ordering on the basis of the faint shadow that the contents cast against its semi opaque container, as would be the case for common

cold storage items such as margarine and milk cartons. These unknowns were further exacerbated by common products where the container changed shape and size as the product was used, such as the wrapper around blocks of butter.

On the basis of an evaluation of their investigations ColdTec decided that the only way to establish whether a neural network could perform the task required was through experimental investigation.

These experiments entailed using Groceryvision on a suite of training images of products likely to be encountered, and then testing its ability to correctly recognise products and volumes.

These experiments addressed an initial hypothesis that set out detailed technical assumptions of how the developers proposed that the neural network would correctly recognise grocery items in a set of images of a fridge interior

Follow up volume-based experiments tested an initial hypothesis that set out detailed technical assumptions of how the developers proposed that the neural network would correctly judge the amount of product remaining in a milk carton.

Subsequent hypotheses set out assumptions of how the system would identify other common products in semi-opaque containers. The company needed to review its approach when the volume-based experiments failed. The company reflected on the failure and eventually resolved the issues by hypothesising that the installation of strong LEDs in the door of the fridge would increase the visibility of the shadow cast by product contents in semi-opaque packaging.

ColdTec documented how it observed outcomes and analysed the data to determine whether the outcome of its experiments confirmed its hypotheses or showed them to be wrong. Finally ColdTec decided it had completed its experimental development activities when it was satisfied that the algorithms met final performance criteria, i.e. in order for the neural network to be classed as recognising the images it must do so with 98 percent accuracy, and for judging the amount of product remaining it must be accurate to within an error margin of 10 percent.

ColdTec self-assessed that training and testing the neural network on a suite of test images was a core R&D activity. To facilitate the experiment, ColdTec needed to generate a series of training and test images to train the Groceryvision neural network. To do this it needed to purchase large amounts of groceries and spend considerable time “staging” fridge interiors. ColdTec’s activities to set up the testing of Groceryvision were self-assessed as an expense component to the core R&D activity.

Although ColdTec felt that it could have also categorised these activities as supporting R&D activities as the image generation itself did not involve an experiment, in the end the company’s self-assessment was that the image generation activities were not meaningfully separable from the neural network training and testing experiments (further discussion on this point is found in the example’s Commentary).

Groceryvision Project Supporting R&D Activity 1: *Image upload firmware for a small microprocessor*

ColdTec needed to develop software able to read images from the cameras in the fridge, compress the images, and upload them to ColdTec's servers. This all needed to be done using a low-cost, low-power processor.

Literature and market reviews determined that image capture from small cameras was a well-known capability and the company was able to adopt an existing method to upload images that did not involve any complex integration of adaptation requirements (that would involve any unknown outcomes or uncertainties). Accordingly the company self-assessed this work to be not eligible as a core R&D activity.

However, because it directly supported the testing of the new image compression method Groceryvision concluded that the work to adapt the firmware was eligible as a supporting R&D activity to core R&D activity 1.

What documentation did ColdTec keep?

ColdTec understood that record-keeping was central to its ability to self-assess its eligibility and its effective management, good planning and robust business systems were fundamental ingredients to its successful innovation.

In relation to its R&D activities, the company kept a register of all of the relevant technical scoping and project planning documents to inform its self-assessment – these could also be used to substantiate its claim should it be subject to a compliance review by the department. In this project the company paid particular attention to records that would verify its claim that the experimental work undertaken met the requirement for core R&D activities that the outcome could not be resolved by using existing knowledge.

In relation to the R&D activities themselves, the company kept records that demonstrated a systematic progression of work (experiments proceeding from hypotheses, followed by observation and evaluation and logical conclusions).

For example the company:

- kept an issues log throughout the development of the image compression algorithm, showing for each issue how the problem was identified, who worked on the solution and for how long, what solutions were tried (including unsuccessful attempts) and a description of the testing undertaken to determine that the issue was resolved, and
- kept an 'experiment log' of attempts to train neural networks, recording for each attempt the network architecture and training data used, the results of testing the network on test data (even when those results were poor), and engineers' commentary on how the setup may be improved for the next experiment.

Commentary

Identifying Core R&D Activities

The R&D Tax Incentive requires that for activities to be core R&D activities they must follow a systematic progression of experimental work. This means they must involve work that proceeds from hypothesis through to experiment, observation and evaluation, and lead to logical conclusions. Often activities developing a new area of technology may involve many experiments and many hypotheses. These activities must also be conducted for a significant purpose of generating new knowledge and have outcomes that are not able to be known or determined in advance.

The R&D Tax Incentive's strong emphasis on having a purpose of generating new knowledge influenced the company's self-assessment and compliance outlook. The company conceded that "at first blush" the various software development and testing activities were seemingly quite routine. This means that where companies are applying new uses of existing technologies, it is particularly important they identify:

- Why technical problems with the new use cannot be resolved by tailoring existing products, methods or processes with current professional knowledge and resources, and
- Why a series of organised experiments are necessary to determine the outcomes of the tests over a range of conditions.

In the Groceryvision project the company took special care to establish how it determined that the outcome of its experimental activities (whether the hypotheses were true or false) could not be known or determined in advance by a competent professional in the field.

The conclusion by its internal expert as to the unknown outcome and need to conduct experimental activities was a reasonably held one. In this example, the engineer had a number of years of experience in the field (10 plus years) which they had supplemented with recently undertaken external literature searches and engaging with a wide range of peer experts over the internet.

Note that searches that are conducted to identify existing solutions to problems faced by the company are not likely to be core or supporting R&D activities.

Clarifying the technical scope and number of registered R&D activities

In settling upon the number and type of activities to be registered under the Groceryvision project the company made some practical judgements based on evidence that justified the approach taken. The scope of registered R&D activities is something that will always require subjective judgements, but must be judgements based on the evidence that the whole of an activity is eligible.

For example, some of the activities to prepare the infrastructure to test the Groceryvision neural network may be supporting R&D activities rather than core R&D activities where they are not immediately part of the experimental activities.

It is a matter for the judgement of companies as to whether an activity that is closely connected to an experiment forms part of the core R&D activity or whether it would be more correctly classed as a supporting R&D activity. When making these judgements, companies should consider whether it is part of the systematic

progression of experimental work by considering how close the activity is to the experiment, its significance to the experiment and the records that can substantiate their decisions.

Example 3: eWatchMakers

This example shows a company identifying core and supporting R&D activities over a hypothetical 3 year business cycle.

In this context, the example illustrates information about core R&D activities useful for registration and some examples of non-experimental activities that are self-assessed as eligible supporting R&D activities. It also highlights some activities likely to be ineligible and the reasons why.

This example shows how the identification and management of eligible R&D activities could link to different points in a company's business cycle:

- developing a new product or solution,
- improving an existing product or solution,
- R&D funded by a customer, and
- early termination of an R&D project.

Business Scenario

eWatchMakers supplies software modules for 'smart' electronic watches. The company became involved in a step-wise progression of R&D projects in line with its expansion into some new market niches for “smart” payment devices.

Business Year One: *Developing a New Product or Solution*

The founders of eWatchMakers have observed the potential for mobile phones to be used as a payment device by transmitting a signal to a point of sale terminal, using software embedded in the phone and a near field communication (NFC) circuit.

Although several international telephone manufacturers were exploring this, the company considered that a potentially successful product would be a smart watch capable of similar functions.

After having conducted an analysis that concluded that there are no such products in the market place, eWatchMakers discovered that their idea faced a number of challenges that could not be resolved using existing knowledge.

Specifically, while there are smart watches on the market that carry a SIM card for phone calls, these do not have the capacity to handle a transmission to a payment terminal. In addition, the small rechargeable batteries in current smart watches all use a design that too quickly drains power during active use.

Communicating with an NFC point of sale device was likely to cause the battery to die much more quickly and lead to the smart watch shutting down prematurely, risking corrupting transactions.

Because these specific problems had not yet been solved and from the company's systematic and thorough research it did not appear that the knowledge to do so was available, the company committed to an R&D programme to create a smart watch capable of conducting payment transactions.

eWatchMakers self-assessed that the activities variously involved in solving how to construct and manage a payment instruction in a smart watch operating system and

how to avoid battery draining will meet the core R&D activity requirements of the R&D Tax Incentive legislation because in each case they require experimentation in the pursuit of new knowledge that could not be known or determined in advance.

There are several core R&D activities identified by the company:

- experimenting with various forms of payment instruction coding; ultimately developing a method that puts part of the payment instruction into the memory chip controlling the watch's functions and the rest onto the SIM, where there is more computational capacity.
- eWatchMakers experimental activities also reveal that by splitting the payment transaction, the power drain on the watch battery can be reduced, because the SIM only needs to transmit for a very short burst.

eWatchMakers also encounters a persistent problem in getting the near field sensor connected to the point of sale terminal to recognise transmissions from the SIM if there is any electronic 'clutter' nearby (something that is inevitable in a retail setting). This results in several dead-ends for the project until the problem is narrowed down to the need for stronger shielding of the SIM inside the watch chassis to prevent interference.

In order to progress its R&D project eWatchMakers acquire 20 of the latest smart watches from each of the five main vendors (100 smart watches in total), 1000 SIM modules and a software programming toolkit that can be used to embed financial transaction instructions onto a SIM. The company also buys a commercial point of sale payment terminal and a simple near field communication sensor as part of the R&D project.

It self-assesses that it can claim these costs¹⁰ under a supporting R&D activity as the items are directly related to the core R&D activity because they are required components for the set up or conduct of the experimentation.¹¹ It considered whether any of these purchased items were *core technology* under the legislation – that is, technology that is purchased to be further developed through R&D activities. If it was core technology the expenditure could not be claimed. However, the company considered that while it needed the watches, SIM modules and the toolkit, it was not further developing the technology in any of them, and its development was clearly a separate technology.

At the end of this period eWatchMakers concluded its experiments and arrived at a working prototype and specification for a smart watch capable of conducting payment transactions.

¹⁰ Under the R&D Tax Incentive an R&D entity is entitled to a notional deduction for:

- expenditure on R&D activities during the income year
- the decline in value of depreciating assets used for R&D activities during the income year
- a balancing adjustment for depreciating assets used only for R&D activities.

See the [ATO website](#) for more information.

¹¹ Note that the purchasing of these items is not an activity as such as they were procured off the shelf. For this reason, the company could have claimed these items as expenses under the core R&D activity.

Commentary

R&D Planning

At the point at which eWatchMakers began to frame its R&D intentions, it set out its technical objectives and how it planned to attempt to experimentally solve the problem(s) identified (the processes of hypotheses, experiments, observation, evaluation), so as to produce solutions to the specific technical problems.

This planning process and record keeping also allowed the company to self-assess all activities and make an accurate determination about what are the 'core' R&D activities and what are eligible 'supporting' R&D activities.

While R&D planning¹² was involved, it is not unusual for the early versions of an R&D plan to be quite basic. For SME's and new entrants to the programme, adopting a systematic R&D planning frame work means that a firm is better able to self-assess and register for the R&D Tax Incentive and meet its compliance obligations (particularly if the claim is selected for review by the department).

Business Year Two: *Improving an Existing Product or Solution*

Twelve months later, eWatchMakers had moved into production and sale of the new smart payment watch.

At that point the company had a new idea: programming the watch's display to change colour briefly when a transaction was completed. The idea was discussed with the company's software engineer, who advised that the idea could be easily achieved, with an extra few lines of code in the watch control module. However, the control module was already known to be operating at near capacity (which is why some transactional functions had been transferred to the SIM). In addition, the supplier advised that a new, higher 'spec' module was available; however, it was susceptible to interference when operated in close conjunction with a SIM in a cluttered electronic setting and the manufacturer stated that it was not suitable for the company's application. The company's engineer had an idea that a new approach to orienting and shielding the SIM might resolve this, but his existing modelling tools and the available information he could find could not tell him if it would work. He advised that the only way to find out if the new module can provide the improved functionality and work in the setting was to undertake a series of tests.

Although the e-Watch had only recently been released to the market, and the proposed new model was similar, the above issue represented a need to experiment to create new knowledge. eWatchMakers therefore undertook a new R&D project.

eWatchMakers ordered 5000 new higher 'spec' control modules. This was significantly more than was needed for testing, but the supplier offered an attractive price.

When the new modules arrived, eWatchMakers commenced an R&D activity to add the additional lines of code, try the new orientation and shielding, test that the colour

¹² Maintaining formal R&D Plans is not compulsory under the R&D Tax Incentive, however evidence of good planning and governance processes form strong supporting evidence for compliance purposes.

screen changes as intended and that the interference levels were within existing electromagnetic screening tolerances.

The first experiment that tested the functioning of the near capacity control module with the additional code, orientation and shielding showed the module's performance was not significantly affected. After this outcome, normal production was briefly interrupted to produce a run of 50 smart watches with the new module for testing. After a series of tests the new module was found to be no more susceptible to interference than the old module.

As stocks of the old watch control module were starting to run low, a decision was taken to convert across to the new module using the stockpile of 4950 that remained from the order, from the next shift.

Commentary

eWatchMakers established that the new module will enable the colour-changing screen feature to be incorporated and it would not have any adverse effect on the smart watch's other performance parameters.

That would normally represent the end of the R&D activity. In determining the scope of the core and supporting R&D activities, it assessed that the testing of the new modules for interference was eligible as core R&D activities (experimental activities) and the interruption and running of the production line to produce 50 samples for testing was a supporting R&D activity (because the dominant purpose was to support the core R&D activity).

However, only 50 modules were required to establish the new knowledge. Therefore the cost of the other 4950 modules that were purchased with a view to production, was not expenditure on either a core or supporting R&D activity.

Nor was the production modification of any of the 4950 new modules eligible as an R&D activity under the R&D Tax Incentive because it was not experimental, did not contribute to the generation of new knowledge and did not directly support a core R&D activity.

Business Year 2–3: *R&D Funded by a Customer*

The founders of eWatchMakers are now successfully manufacturing a range of smart watches that are capable of being used for financial transactions for domestic and international markets.

After observing the trend towards product branding, the founders decided that they would develop a product for the luxury watch market. They successfully approached the world leading GARGA brand with the concept. GARGA agreed to fund the development of an exclusive smart watch, on the basis that it would own the rights to certain aspects of the specialised design. GARGA decided that the watch would use the rare metal palladium because of its exclusivity and also because it was recyclable.

eWatchMakers investigated palladium and found that it generally had the required metallurgical qualities; however, there was some question about whether the metal would cause adverse electronic interference.

eWatchMakers developed an R&D plan for the 'GARGAwatch', that focused on the major area of uncertainty – whether a watch made of palladium would alter the shielding required for the SIM. GARGA agreed to fund the development of a prototype smart watch.

After conducting market and internet searches, eWatchMakers learned that palladium was routinely used in electronic components. This view was confirmed when they obtained metallurgical advice that the use of palladium was well known and no experimental activities would be required. The company was further advised that any minor screening modifications could be resolved by a competent professional in the field on the basis of current knowledge, information or experience. eWatchMakers decided to press ahead with the development of the new 'GARGA-watch' using existing screening components, with a view to the conduct of interference testing after the product passed GARGA's design approval stage.

However, eWatchMakers also learnt during its internet searching that palladium could cause skin allergies. When advised of this during product evaluation meetings, GARGA decided to discontinue the R&D project, and met agreed termination costs.

Commentary

Based on this body of work eWatchMakers does not have an eligible R&D Tax Incentive claim for these activities, because it was not conducting any eligible R&D activities since no significant experimental activity was required and any minor screening modifications could have been resolved by a competent professional in the field on the basis of current knowledge, information or experience.

Business Year Three: *Early Termination of an R&D Project*

eWatchMakers decided to press ahead and develop its own luxury palladium watch. The company focussed its R&D effort on whether the allergy issue could be overcome by a special coating. Because GARGA was no longer funding the development, eWatchMakers decided to consider whether it could register the project with the department.

In view of the company's uncertainty about how much, if any, of its project would be eligible under the R&D Tax Incentive, eWatchMakers decided to apply to Innovation and Science Australia for an Advance Finding before it included any tax offset calculations in its tax return.

After its consideration of the eWatchMakers's Advance Finding application, the department advised the company of Innovation and Science Australia's decision that only the proposed activities associated with investigating and testing the efficacy of possible new non-allergenic coatings for palladium would be eligible as core R&D activities, as all other aspects of the project do not offer the prospect of new knowledge that could not be known or determined from current knowledge, information and experience.

A short time after eWatchmakers received the outcome of its Advance Finding application it reviewed the overall commercial viability and market prospects of its palladium watch proposal and decided to terminate the project.

Commentary

Early Termination of an R&D Project

Although eWatchMakers had taken a commercial decision to terminate the R&D project it could still claim the tax offset for the eligible R&D activities it undertook that were covered by the Advance Finding. In effect eWatchMakers was still able to offset those eligible R&D Tax Incentive expenses in its next tax return, even though the R&D project was discontinued. Even though they were terminated for commercial reasons before generating the hoped for new knowledge, the activities were being conducted for a significant purpose of generating new knowledge.

What documentation did eWatchMakers keep?

In relation to the various R&D projects eWatchMakers had R&D planning documentation and auditable version control records of its software development and the records of the design, conduct and results of its testing procedures. The company maintained electronic folders for all key letters, research reports and emails relating to the proposed R&D (including the unexpectedly protracted resolution of the interference issue). It had the 'before and after' reports of the electromagnetic field test results when the interference problem was finally resolved and the interactions with the department in relation to its Advance Finding application.

eWatchMakers kept a record of its application for the Advance Finding and notification of the partially favourable decision from Innovation and Science Australia. It also maintained records of the experimental activities and directly related activities for the coating development conducted up to the date when the project was terminated.

Example 4: Push Through Technologies

This example provides further insights around the description and classification of core and supporting ICT R&D activities and related record keeping practices. It also illustrates how a company manages the situation where part of the project is conducted overseas and before registering or claiming the overseas activity an Overseas Finding must be obtained.

The four key requirements for overseas activities are:

- the overseas activity must be an eligible R&D activity,
- the overseas activity must have a significant scientific link to an Australian core activity,
- the overseas activity must be unable to be conducted solely in Australia (for reasons specified in the legislation), and
- the project's expenditure on the overseas activities cannot exceed the expenditure on the related Australian activities.

Business Scenario

Push Through Technologies Pty Ltd (PTT) is a small start-up company whose directors met at university in the course of their post-graduate research. The directors developed a model for more effective packet switching algorithms for 4G mobile communications systems that could be sold to large network equipment manufacturers. Part of PTT's business is based on the generation and protection of leading edge IP.

In planning its R&D project, the company developed objectives to define the scope of its proposed R&D.

Through its background research PTT became aware of the existence of technical issues in Australian 4G telecommunications networks that meant that the company would have to test offshore. The company identified a research team in Hong Kong that could perform the testing.

As it planned the project, PTT self-assessed that it would be eligible for the R&D Tax Incentive. However, it also realised that overseas activities of R&D projects require an Overseas Finding in order to register and claim activities and related expenditure.

PTT Project's Core R&D Activity 1: *Testing and refining a new algorithm including using a simulation tool*

This activity included work on verification, modelling and validation using a simulation tool and real world testing within the limits of the Australian networks, which included the specifications of the required performance parameters. Testing using a simulation tool would not be eligible as a core R&D activity on its own, as the simulation tool used existing knowledge to determine the outcomes of the simulations of the company's designs. However, PTT could not get all the information about how its design would perform from the simulation tool to determine whether its hypotheses about its design actually worked, and would need to conduct real world

experiments within this activity and under a second activity (activity 2) to get all the data required. PTT assessed that when considered together, activity 1 and activity 2 comprised the required systematic progression of experimental work to resolve outcomes that could not be determined using existing knowledge.

PTT undertook an evaluation of the system throughput and the average system delay as well as other parameters such as packet loss rates and resource allocation.

A number of additional technical issues arose during the testing, particularly relating to achieving throughput and maintaining Quality of Service requirements around multi-media applications.

As it progressed this activity PTT documented the iterative changes made to the algorithm during its development, and the subsequent tests undertaken to validate these changes using the simulation tool.

PTT Project's Core R&D Activity 2: *'Real world' testing and development of the DPS algorithm*

While the simulations and the limited testing that could be done on Australian networks were promising, they could not represent the full range of complexities that existed in a real world network. To establish that the algorithm satisfied requirements in a "real world" scenario, PTT engaged a research team at a Hong Kong university to undertake the testing of its algorithm in the Hong Kong telecommunications network.

Testing parameters and evaluation processes largely mirrored those used in their Australian simulations and expanded on the Australian network tests. Issues that arose during the testing process were relayed back to Australia for further investigation, simulation and network testing and improved versions of the algorithm were then sent back to Hong Kong for testing.

Once all remaining technical issues were resolved, and the company had completed its testing on both overseas, and as a final step the Australian networks, the algorithm was considered final and the R&D activities were complete.

Before it claim the overseas activity, the company needed to ensure it applied for an Overseas Finding. It needed to ensure that it applied for the Overseas Finding before the end of the income year in which it first wanted to claim the overseas activities.

PTT Project's Supporting R&D Activities: *Background performance studies on existing algorithms; design of a new algorithm*

Prior to undertaking the core R&D activities, PTT undertook background studies of literature (including journal articles, standards and patent literature) and documented all known packet scheduling algorithms developed for 4G networks.

For each of these listed algorithms PTT undertook systems performance studies. The company identified the following problems with the existing algorithms:

- There is a trade-off between resource allocation and system throughput, and
- The company was not able to satisfy Quality of Service requirements of multi-media applications.

As these problems were identified, the PTT technical team developed in parallel a purely theoretical model which addressed the criteria for the new algorithm. On the basis of this model, the team developed a detailed algorithm design and a flowchart mapping the steps.

This initial design of the algorithm was undertaken in a purely theoretical environment and did not involve testing of the algorithm; as no experimental activities were undertaken, the activities were not considered to be core R&D activities. However, this work framed the hypotheses for initial experiments in the subsequent PTT Project's core activities. As a result of this direct relationship to the core R&D activity, PTT self-assessed the activity as a supporting R&D activity.

What documentation did PTT keep?

In relation to its R&D project the company maintained a full spectrum of related records including:

- Project planning and project risk management documentation.
- Results of literature searches and notes and communication records with an expert (this included evidence as to why the tests could not be conducted in Australia, which is of particular relevance to the Overseas Finding).
- Documentation of the studies undertaken on other algorithms, including reasoning for conclusions.
- Design documentation for the algorithm (even including photos and scans of whiteboard sketches used in the design process).
- Documentation of the verification methodology and process undertaken in Hong Kong (including for algorithm designs that failed verification).
- Documentation of the modelling system and parameters used.
- Documentation of the validation process for each iteration of the algorithm, and results and analysis of each test undertaken on the algorithm as it was developed.
- Details as to the changes made to the algorithm as a result of verification, modelling and validation testing (this can include code repositories which apply version control).
- Methodology, results and analysis for the network testing undertaken in Australia.
- Methodology, results and analysis for the network testing undertaken in Hong Kong.
- Communications around changes made to the algorithm as a result of tests in Hong Kong, and documentation of subsequent verification, modelling and network testing work undertaken in Australia.
- Records of costs incurred to date on R&D activities and reasonable cost estimations for undertaking any related future R&D activities, separately for the Australian and the overseas activities.

Commentary

Simulations using existing knowledge

Activities where outcomes are determined using existing knowledge, such as by modelling outcomes, or 'simulating' experiments, are not eligible core R&D activities on their own. If real world experimental activities are also carried out, these activities may be core activities when considered together, if the evidence supports that they are part of the same systematic progression of experimental work.

Activities such as modelling may also be supporting activities to core activities, where they meet the necessary requirements to be directly related to the core activity.

Advance/Overseas Finding

The overseas core R&D activity could only be registered and claimed if this activity was covered by an Overseas Finding.

The Advance and Overseas Finding is designed to provide certainty to companies about their entitlement to benefits under the R&D Tax Incentive. It provides a binding determination issued by Innovation and Science Australia as to whether certain activities are eligible to be claimed under the programme¹³. There are strict deadlines to apply for an overseas finding – before the end of the income year in which you wish to start claiming for that activity.

Overseas work must satisfy four requirements to be eligible as an overseas activity:

- The overseas activity must be an eligible R&D activity,
- The overseas activity must have a significant scientific link to the Australian core activity,
- The overseas activity must be unable to be solely conducted in Australia or its external Territories, and
- The project's expenditure on the overseas component cannot exceed the expenditure on the related Australian components.

The overseas activity must be an eligible R&D activity

On the basis of its self-assessment, PTT considered that the testing to be undertaken in Core R&D Activity 2, “‘real world’ testing and development of the DPS algorithm” met the eligibility criteria to be a core R&D activity.

When it applied for an Overseas Finding, PTT described how it could not know or determine the outcome of the testing in advance on the basis of current knowledge, information or experience. The company used evidence from its background research to back this up. The company further described how the activity would be a systematic progression of work. In short, it would proceed from hypothesis to experiment, observation, evaluation and lead to logical conclusions.

¹³ Guidance in relation to Overseas Findings can be found in the *Overseas R&D – Information Sheet* and in the *Guide to Findings* found on the business.gov.au website.

The company also described what new knowledge it would be seeking to be generated by conducting the activity. It should also be noted that if a company seeks an Overseas Finding on a supporting R&D activity, it is also required to demonstrate that the activity satisfies the definition of a supporting R&D activity (i.e. subject to all the relevant eligibility criteria of a supporting R&D activity).

The overseas activity must have a significant scientific link to an eligible Australian core activity

In its Overseas Finding application, PTT clearly showed the significant scientific link between the planned overseas activity and the Australian core R&D activity, the 'Australian core activity'. This requires that the Australian core activity cannot be completed without the overseas activity. The company explained that the modelling and evaluation of the algorithm on computers and the limited testing possible on Australian networks (Core R&D Activity 1) was the first phase of testing and that second phase experiments involving transmissions on overseas telecommunications networks were necessary to ensure the algorithm behaved in practice as modelled and tested in Australia.

Moreover, the process of testing overseas was highly likely to lead to changes in the algorithm. As a result of those tests, new versions of the algorithm would be tested in the Australian simulation environment prior to being introduced into the "real world" testing environment in both Australia and overseas networks. The final testing of comparability with Australian networks could only be done when the algorithm was in its final functional form through the overseas testing. For this reason, Core R&D Activity 1 could not be completed without the overseas activity (Core R&D Activity 2) taking place.

In order to satisfy the link to an Australian core activity, the company has to satisfy Innovation and Science Australia that the Australian activity is an eligible core activity, even if the company does not request a Finding for the Australian activity.

The overseas activity must be unable to be conducted in Australia

To be eligible for the R&D Tax Incentive, R&D activities that are proposed to be conducted overseas must not be able to be solely conducted in Australia (or its external Territories) for one of four reasons:

1. Conducting the R&D activities requires access to a facility, expertise or equipment not available in Australia or its external Territories,
2. Conducting the R&D activities in Australia or its external Territories would contravene a law relating to quarantine,
3. Conducting the R&D activities requires access to a population (of living things) not available in Australia or its external Territories, or
4. Conducting the R&D activities requires access to a geographical or geological feature not available in Australia or its external Territories.

PTT knew that it was not able to conduct the research activities in Australia as the facilities, equipment and expertise it needed to test the algorithm in the foreign network where it was intended to be used are not available. The company provided technical evidence that showed that full testing in Australia was not possible because

of the differences between the Australian and foreign networks. The company demonstrated this by providing literature references, together with a letter from an independent industry expert. It also took care to explain that its R&D project could not be completed without this overseas work.

Total expenditure on eligible overseas activities of the project must be less than the expenditure on the eligible Australian R&D activities

In its Advance/Overseas Finding application, PTT includes the total actual and reasonably anticipated expenditure that will be incurred for each of the project's separate R&D activities. The detail in PTT's application allowed Innovation and Science Australia to see that the expenditure on related Australian core and supporting R&D activities was anticipated to be \$935,000 and the expenditure on the overseas activities would be \$565,000. As the expenditure on the proposed overseas activities was less than the related Australian-based expenditure the overseas activities met this requirement.

The company did not seek to register or claim any activities relating to the commercial and administrative aspects of patenting its algorithm, including the costs of its patent application and associated attorney fees. These activities are excluded from being core R&D activities under the R&D Tax Incentive legislation. Under some circumstances they may be considered to be supporting R&D activities if they were conducted for the dominant purpose of supporting one or more of the core R&D activities. However, PTT's dominant purpose of undertaking these activities was to protect its commercial interests in its intellectual property, and not to support the core R&D activities of testing the algorithm.

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